MODERN Machine Shop

HOWARD CAMPBELL, Editor

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MODERN Machine Shop

NCINNATI, OHIO VOL. 7, NO. 3

AUGUST, 1934

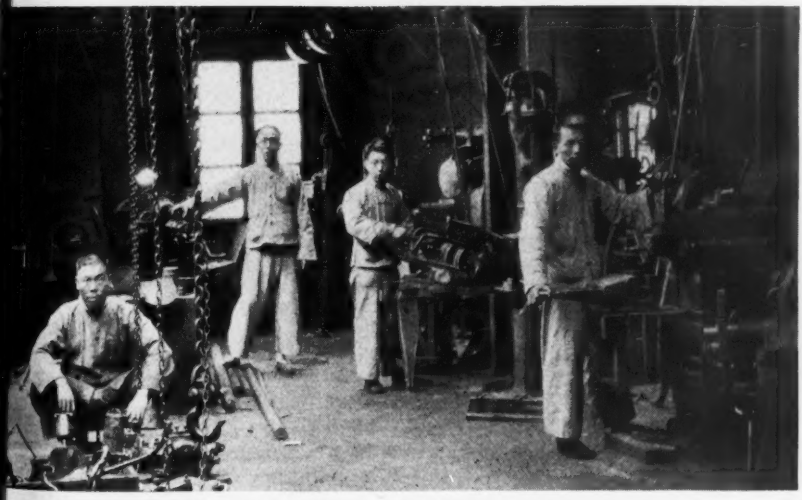
The Oriental Craftsman

o the Engineer or Mechanic of the Western World, the Chinese Craftsman, with his Unique Methods and in Many Cases Primitive Equipment, Is An Interesting Study

BY WALTER BUCHLER

HE Chinese civilization is one of the oldest of which there is any cord. To the inventive ability of e Chinese we are indebted for gun- wder, sugar, paper, and many other hly useful articles. Accordingly, it would seem that the Oriental mechanic would be quick to grasp the principles upon which the Occidental methods are founded, but such is rarely the case.

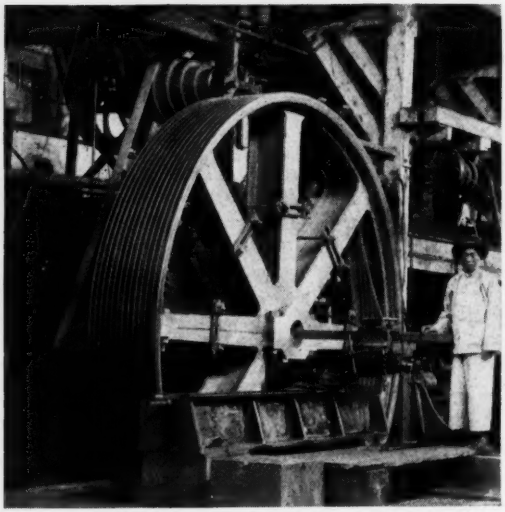
The Chinese population contains a



Chinese mechanics at work in a Shanghai machine shop.

great many native craftsmen who operate in a small way to produce the utensils, small fixtures, trinkets and other metal commodities that are required in the every-day life of their people. Their shops are small, indeed, and their machines and tools are of quite primitive design, though it must be conceded that with this equipment they turn out some marvelous work, after their own fashion.

Chinese machine shops, in the modern sense of the word, exist mostly where the European or American influence prevails to a large degree, and such shops will usually be found in connection with shipyards, marine repair shops and docks, and factories that have been established in the larger Oriental cities.



Making a rope sheave for a cotton mill. The machine is a pit-lathe, and the operation is that of boring the hub.

In these places the working forces are comprised almost entirely of native workmen, supervised by European or American superintendents. The superintendent usually transmits his orders to the workmen through the native foreman, who, of cour understands English well enough understand the orders and to repe in an intelligible manner.

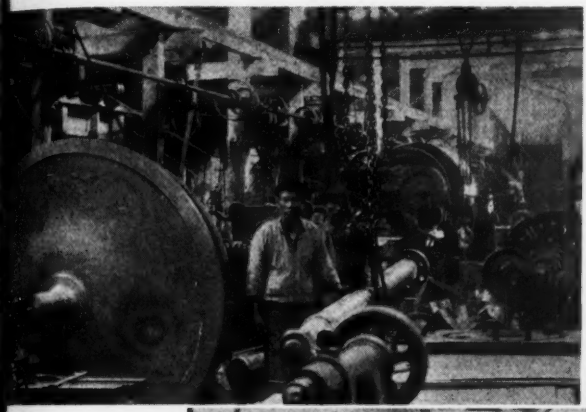
The Oriental mechanic serves apprenticeship in much the same w as any other tradesman, his te varying from three to five yea The physique of the Oriental is equal to that of the Englishman American, and when assigned heavy work, he invariably slows do Although he learns to handle mod tools properly, he is ne entirely weaned away fr his Oriental customs habits; thus, although usu a steady workman, he w insist upon assuming a co fortable position while wo ing.

A fitter, for instance, be found squatting by side of the job in a comfo able position while filing doing other work that co be done better while sta ing. The fact that he slowing the job is of no i portance to him. The Chine of the more intelligent cl is traditionally of a philo phical turn of mind, and quite unable to understa the necessity for speed as is regarded in America.

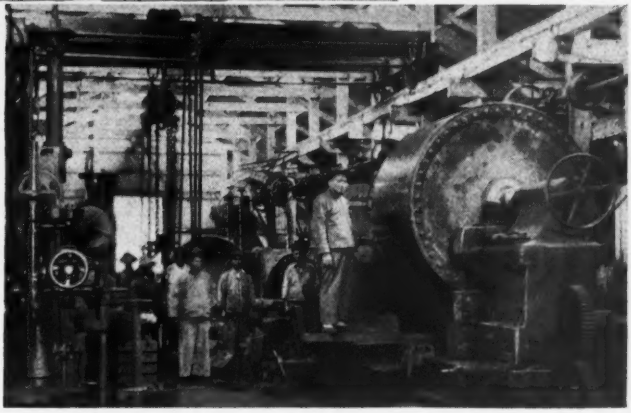
An English firm operati in the Orient imported fr England a machine for weaving p terns in colors. Eventually the m chine arrived, but the necessary dra ings and instructions to explain t operation of the machine were mi ing. As the purchaser wanted use it as soon as possible, the ag gave his No. 1 fitter the job of fi ing out how the machine worked. A though he succeeded at last, the fit spent over a month finding out wh the various parts were for.

Although not naturally ambitio

t occasionally happens that the Chinese mechanic becomes the boss of his own establishment. Someone offers him some used machines at a cheap figure and if he has any money, he sets up in some small building which may have served as a confectionery store or green grocer's shop. His miniature machine shop may not have more than 100 square feet of floor space, and his machine-tool equipment — consisting most likely of a lathe and a drill press — will be sadly out of date. But he will refuse no job that is offered to him, and any work requiring tools beyond the equipment of his shop will be taken by him to another shop, probably a foreign establishment, where the necessary equipment is to be found.



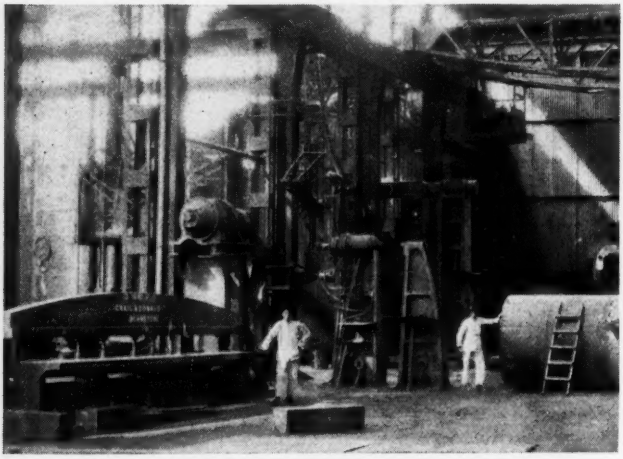
The pictures shown above and at right were taken of opposite ends of the main bay in a Shanghai shop.



The business that comes to these small native shops consists mostly of repairs to small Chinese steamers, launches and machinery from smaller shops and factories. The prime factor in such jobs is cheapness. The small overhead, the small space, and the fact that the native workmen will work longer hours at smaller pay for one of their own race makes it possible for the native shop to obtain enough business to keep going. The shop owner is not too particular as to the kind of material that he uses, however, and is quite capable of using mild steel where tool steel should be used, because the mild steel is cheaper.

It seems difficult for the Oriental workman to accept the possibilities of high speed steel for cutting tools, and while his workmanship and accuracy may be beyond question, his speed will be nominal. In England or America an automatic machine that

is built to perform six operations will be set up to make use of the six spindles. But if not watched, the Chinese workman will use the machine to perform only three or four operations. Machines that perform several operations and thus make it possible to operate with fewer men do not appeal to these people.



Not all the tools are ancient; in the center of the illustration can be seen a hydraulic riveting machine. This picture was taken in a shipbuilding plant in Shanghai.

The Chinese machine hand is usually quite proud of his ability and prestige, and will often work out a way to get a job done upon his own initiative and without asking for any advice, though sometimes to the detriment of the job in hand. The Chinese are taking to Western ways more now, however, than has been the case in the past. The increasing use of the automobile and other modern mechanical units is making necessary the use of more modern equipment for repair work.

Production machinery has not yet come into use in China, as there is very little metal manufacturing of a type that requires the production of duplicate parts in large quantities. Such production work as is being done is being turned out on ordinary lathes and other standard machines.

There is an ample supply of mechanics in Shanghai and other coast cities of China. A number of them have been trained in the foreign shipyards and shops attached to large engineering plants, while the others received their training in the small native Chinese shops. The training in the small shops is fairly good, but is usually confined to small work. Except in rare instances, mechanics who are capable of doing heavy work are only to be found in the big engineering shops where such work is constantly being done. A Chinese machine hand earns from $1 to $1.50 a day.

Patternmakers in such larger places as Shanghai may be called upon to make a pattern for any part of an engine—be it gas, line or steam—as well as to do other minor work. Not having the modern equipment that is found in the pattern and machine shops in America and Europe, the work may take longer, but the work will be satisfactory.

A Chinese patternmaker invariably starts from the inside and works out. That is the method they are taught in the shipyards, the method having been adapted to the peculiarities of the Oriental mind. Were a native patternmaker to attempt to start from the outside and work toward the cen

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ter, he would soon become confused due to the inability of the native to visualize anything that he cannot see.

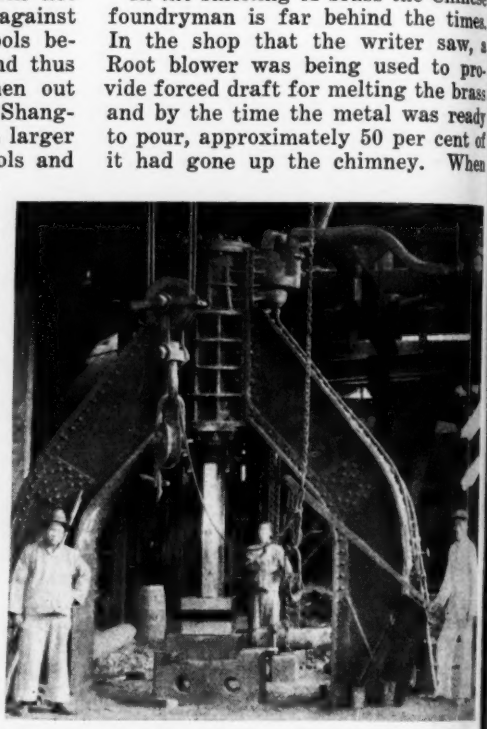
Ninety per cent of their labor is by hand, and they usually take about three times as long on a job as an American patternmaker, due to the primitive tools used. They will not use any other, and are set against the introduction of modern tools because such tools are faster and thus tend to put some of their men out of work. Stiff competition in Shanghai is, however, compelling the larger plants to introduce modern tools and force their workmen to use them.

In recent years sand and loam have been introduced, but previously sand alone was used and the method was primitive; the molder simply dug a hole in the sand, put the pattern in, set a box corresponding to the cope over the pattern, filled it with sand, and rammed hard. The cope would then be lifted off, the pattern taken out, the cope replaced, and the metal poured. The castings produced by this method were very difficult to machine.

The quality of sand obtained in Shanghai is inferior to that used in America or England. The sand comes from Ningpo and the loam from Hankow, but mixed together they form a passable "mud" as the Chinese call it. The Chinese molder is somewhat backward at making collapsible cores for small work. At work he squats for sand molding on the floor, but stands up when doing a large job of loam molding.

The Chinese method of smelting iron is astonishing, but the amount of iron that can be turned out of a Chinese cupola is still more surprising. The cupola is usually made of a sheet metal cylinder, lined with fire clay and bricks and with a grate across the bottom. As the iron melts, it flows into a receptacle at the bottom of the cupola. When enough has been melted, the plug is punctured and the metal is run into a ladle.

In the smelting of brass the Chinese foundryman is far behind the times. In the shop that the writer saw, a Root blower was being used to provide forced draft for melting the brass and by the time the metal was ready to pour, approximately 50 per cent of it had gone up the chimney. When a foreigner is having a casting made, he usually has to stand over the molders to see that the metal is melted with a natural draft so that the metal will be melted without vaporizing it.



The Oriental hammerman is as adept at the operation of the steam hammer as his American brothers.

The Chinese blacksmith uses a forge made by setting a cylinder of iron in the ground and covering it with a primitive sort of fire-grate over which

he heats the work. Draft is supplied to the fire by means of a bellows operated by a small boy. The necessary heat is obtained, but the method is slow.

At coppersmithing, however, the Chinese artisan excels. He will attempt the patching of any kind of a job, and will do it well. The tools used for this work resemble those used in America, and the methods are similar. Copper is much used for utensils, decorative designs, and other things, but once made, a copper article will be used as long as there is anything left to patch. Hence the coppersmith is kept quite busy making repairs.

The Chinese are good at electro-welding, even on difficult work. There is a great deal of boiler work done in Shanghai and Hong Kong, both from the ships that put in at these ports and from the mills in and around the cities. Boilers are usually in need of much repairing, due to the fact that they are allowed to go so long before the repairs are made. And boilers "go up" in China more often than in America, for the same reason.

This statement applies particularly to Chinese factories where no foreign supervisors or engineers are employed. The Chinese employer or engineer is rarely well enough posted to know when a boiler has reached the dangerous stage.

Platers (men who repair or replace plates on a steel vessel), riveters, caulkers, and drillers are employed in Shanghai much in the same manner as in other shipyards, but the trades work under different conditions. The workmen are paid at piece rates and are supervised by a No. 1 Chinese contractor, who quotes his employers a price for the entire job. The contractor may have been with his firm many years and has probably worked up from a job as rivet heater or helper.

After having become expert as a plater, and as soon as he has accumulated some working capital, he will start contracting. The No. 1 contractor has sub-contractors, each of whom quotes the No. 1 contractor on the work that comes under his jurisdiction, such as boiler work, riveting, welding, and so on. He totals their bids, adds his percentage, and then quotes the firm. By following this procedure, estimating comes much easier to an engineering firm as they are able to figure their profits as based upon the actual cost instead of an estimated cost. The method is practicable and in many cases preferable, because labor is cheap in China and the Chinese work much better and cheaper when working for a contractor of their own race than they would if working for the engineering firm direct.

There are some highly skilled ship platers in Shanghai who are unsurpassed in marking off plates of any shape or fashion. They fashion and shape the plates by primitive methods, forming them by the use of holes in the ground. Flanging machines and presses are not found here, and it would probably be folly to import them as labor is cheap and plentiful. The best men earn as much as $2.50 to $3 a day, which is considered very good pay in China.

The transportation problem is solved to a large extent by the use of the Chinese common porters, or coolies, who carry their loads by means of bamboo poles slung across their shoulders. They will carry anything that they can lift, provided it is not top-heavy. Mechanical means of transportation do not appeal to the Chinese; they insist upon going about it in their own way, and taking their own time. "East is East and West is West", and the Chinese are in no hurry to adopt western ideas and methods.

Fits and Tolerances

By J. G. Hommel

M. & P. Engineering, Westinghouse Electric & Mfg. Company

TECHNICAL literature contains considerable data on the amount of allowance necessary for turning and boring operations in order to achieve a certain degree of tightness (or clearance, as the case may be) between two mating parts, as, for example, between a motor shaft and a pinion. Quite a few of the tables of allowances and tolerances available, however, go to such a high degree of refinement that they become unworkable when they are transmitted to the shops for everyday production, which is quite different from the manufacturing of a high-class tool or a precision instrument, where time and cost are generally of minor consideration.

The following tables of Fits and Tolerances have for some time been in practical use with a large manufacturing concern and are giving good results, while at the same time allowing the maximum tolerance to take care of slight inaccuracies and variations in machine tools of the various types and kinds and the never negligible presence of the element of human error.

The figures shown supersede others, which, although computed by people conversant with the product, had not proved practical. The figures illustrated opinions of competent individuals, but could not often be realized in commercial manufacturing without unnecessary sacrifice of time and cost, tho without adding appreciably to the quality of the product. For obtaining values that had been found satisfactory in machining, assembling and in operation, numerous measurements were taken to find out what had actually been done by the workmen and what the actual dimensions were on the parts that had passed rigid inspection. In taking measurements of bores, an instrument was used which gives direct readings on a large scale. This instrument—the Zeiss "Passimeter"—is extremely accurate and is so designed that no opportunity is afforded for variations due to individual handling in taking the measurements.

The tables shown are accompanied by lists of definitions of the terms used, together with examples illustrating methods of specifying allowances and tolerances on the drawings. It has been the object to make the tolerances for a bore somewhat larger than for the corresponding turned part, as it is much easier to make and measure a turned part to close limits than it is the bore.

The unilateral system has been used; i. e., the bore is made basic, or from zero to plus, and the necessary fit allowance to the turned part is added.

There are some exceptions to this rule, for various reasons. Where cold rolled stock is used, supplied by the mills to minus tolerances, the tolerances for the corresponding mounting have to be adjusted accordingly. Some of the tables had to meet the needs of certain types of equipment or apparatus, but it may be said that similar conditions will be encountered in different industries. In some

cases it may be necessary to extend the range of a certain table either upward or downward, but in general it should be possible to do so without the necessity of formulating additional tables.

In specifying the dimensions of a shaft on a drawing, it has been customary to specify the larger dimension first, thus: 4.005, 4.003, as the tendency of the workman is generally to try for the dimension appearing first, which is 4.005. If an inaccuracy occurs he will still be on the safe side as he has two thousandths of an inch to go before the piece is spoiled.. The opposite applies to the bore, which is specified 4.000, 4.002, starting with the lower dimension. If aiming for 4.000 he would still be permitted to err within two thousandths before the piece is rejected. The nominal diameters shown in the tables are selected from the "Fractional Preferred Numbers" recently approved by the American Standards Committee.

DEFINITIONS

BASIC DIMENSION is the theoretical or nominal standard size from which all variations are made. The basic dimensions will include the allowance for fits.

LIMITS OR LIMITING DIMENSIONS are the specified maximum and minimum dimensions permissible for any basic dimension.

TOLERANCE is the prescribed difference between the limiting dimensions prescribed for any basic dimension.

ALLOWANCE is the prescribed difference between the dimensions of mating parts to provide for various classes of fits. This may be further divided into:

Nominal Allowance, which is the difference between the basic dimensions of the two mating parts;

Minimum Allowance, which is the smallest allowance permitted by any combination of the limiting dimensions of two mating parts;

Maximum Allowance, which is the greatest allowance permitted by any combination of the limiting dimensions of the two mating parts.

EXAMPLE

A shaft is to be pressed into a spider. The dimension should be specified as follows:

Diameter of shaft 4.253

4.253

4.2525

Bore of spider 4¼

4.250

4.251

Basic dimension of shaft is 4.253

Basic dimension of spider is 4¼

Limiting dim. of shaft are 4.253 and 4.2525

Limiting dim. of spider bore are 4.250 and 4.251

Tolerance of shaft is 4.253—4.2525 = .0005

Tolerance of spider bore is 4.251—4.250 = .001

Nominal allowance is 4.253—4¼ = .003

Maximum allowance is 4.253—4.250 = .003

Minimum allowance is 4.2525—4.251 = .0015

TABLE 1
LOOSE FIT

Nominal Diameter	Turn		Bore		Clearance	
	Max.	Min.	Min.	Max.	Min.	Max.
Above .125 to .250	0	—.002	+.002	+.007	.002	.009
" .250 " .300	0	—.002	+.004	+.011	.004	.013
" .300 " 1.000	0	—.003	+.006	+.016	.006	.019
" 1.000 " 2.500	0	—.004	+.008	+.016	.008	.020
" 2.500 " 4	0	—.005	+.008	+.016	.008	.021

Pin or Hole Equivalent: Based on C.R.S. stock, adaptable for automatic screw machine production. Not reamed. To be specified on drawing to the nearest number, letter or fractional drill that will result in a hole which will come within the specified tolerances.

Example Designation: (For ¼ in. diameter loose fit) = .257 drill.

Example Application: Hinge Pin..

TABLE 2
WORKING FIT—INTERMITTENT MOTION

Nominal Diameter	Turn		Bore		Clearance	
	Max.	Min.	Min.	Max.	Min.	Max.
Above .125 to .300	0	—.002	+.001	+.003	.001	.005
" .300 " 1.000	0	—.003	+.001	+.005	.001	.008
" 1.000 " 2.500	0	—.004	+.001	+.005	.001	.009
" 2.500 " 4.000	0	—.005	+.001	+.005	.001	.010

Pin or Equivalent: Based on C.R.S. stock, adaptable for automatic screw machine production. When other materials are used it may be necessary to grind pins on centerless grinder.
Hole: Special reamers or 4 lip drills.
Example Application: Motor operated mechanisms.

TABLE 3
SLIDING FIT

Nominal Diameter	Turn		Bore		Clearance	
	Max.	Min.	Min.	Max.	Min.	Max.
Above 20 to 40	—.003	—.006	0	+.003	.003	.009
" 40 to 64	—.006	—.010	0	+.004	.006	.014
" 64 to 100	—.010	—.015	0	+.004	.010	.019
" 100	—.015	—.020	0	+.005	.015	.025

Rocker Ring or Equivalent: Turned.
Hole: Bored.
Example Application: Brush Rigging Device on Generator Frames.

TABLE 4
RUNNING FIT—LOW SPEEDS

Nominal Diameter	Turn		Bore		Clearance	
	Max.	Min.	Min.	Max.	Min.	Max.
Above .125 to .300	—.001	—.002	—.0005	+.0005	.0005	.0025
" .300 " .750	—.0015	—.003	—.0005	+.001	.001	.004
" .750 " 1.250	—.002	—.004	—.0005	+.0015	.0015	.0055
" 1.250 " 2.000	—.0025	—.0045	—.0005	+.0015	.002	.006
" 2.000 " 4.000	—.003	—.003	—.0005	+.0015	.0025	.0065

Pin or Equivalent: Grind on centerless grinder or equivalent.
Hole: Standard Reamers.
Example Application: Manually operated mechanisms.

TABLE 5
SNUG FIT

Nominal Diameter	Turn		Bore		Clearance	
	Max.	Min.	Min.	Max.	Min.	Max.
Above 2 to 4	—.0005	—.001	0	+.001	.0005	.002
" 4 " 6	—.0005	—.0015	0	+.0015	.0005	.003
" 6 " 10	—.001	—.002	0	+.002	.001	.004
" 10 " 16	—.001	—.003	0	+.002	.001	.005
" 16 " 25	—.002	—.004	0	+.003	.002	.007
" 25 " 40	—.002	—.005	0	+.003	.002	.008
" 40 " 64	—.002	—.005	0	+.004	.002	.009
" 64	—.003	—.006	0	+.004	.003	.010

Shaft or Equivalent: Turned.
Hole: Bored.
Example Application: Bearings and Vertical Bearing Brackets.

TABLE 6
CLOSE FIT

Nominal Diameter	Turn		Bore		Clearance	
	Max.	Min.	Min.	Max.	Min.	Max.
Above .125 to .300	0	—.0005	0	+.0003	0	.0008
" .300 " .750	0	—.0005	0	+.0005	0	.001
" .750 " 1.250	0	—.001	0	+.0005	0	.0015
" 1.250 " 2.000	0	—.001	0	+.0008	0	.0018
" 2.000 " 4.000	0	—.001	0	+.001	0	.002

Pin or Equivalent: Turn from nearest larger stock size and grind on centerless grinder or equivalent.
Hole: Use selected reamers.
Example Application: Lock Pins.

TABLE 7
CLOSE FIT

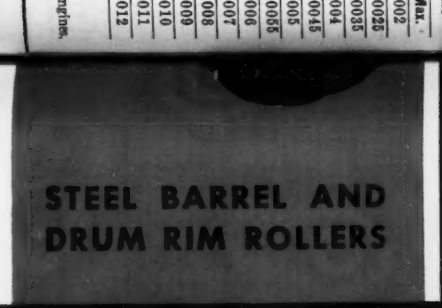
Nominal Diameter	Turn		Bore		Clearance	
	Max.	Min.	Min.	Max.	Min.	Max.
Above 2 to 4	0	—.001	0	+.001	0	.002
" 4 " 6	0	—.001	0	+.0015	0	.0025
" 6 " 12	0	—.001	0	+.002	0	.003
" 12 " 25	0	—.002	0	+.002	0	.004
" 25 " 50	0	—.002	0	+.003	0	.005
" 50	0	—.003	0	+.004	0	.007

Shaft or Equivalent: Turned.
Hole: Bored.
Example Application: Self-Aligning Bearing and Horizontal Bracket or Pedestal.

TABLE 11
HEAVY PRESS FIT—(USED ALSO AS LIGHT SHRINK FIT)

Nominal Diameter	Turn		Bore		Interference	
	Max.	Min.	Min.	Max.	Min.	Max.
Above 1½ to 2	+.002	+.0015	0	+.0007	.0008	.002
" 2 " 2½	+.0025	+.002	0	+.001	.001	.0025
" 2½ " 3¼	+.0035	+.003	0	+.0015	.0015	.0035
" 3¼ " 4	+.004	+.0035	0	+.0015	.002	.004
" 4 " 5	+.0045	+.004	0	+.0015	.0025	.0045
" 5 " 6	+.005	+.0045	0	+.0015	.003	.005
" 6 " 8	+.0055	+.055	0	+.0015	.0035	.0055
" 8 " 10	+.006	+.0055	0	+.0015	.004	.006
" 10 " 12	+.007	+.006	0	+.0015	.0045	.007
" 12 " 16	+.008	+.007	0	+.0015	.0055	.008
" 16 " 20	+.009	+.008	0	+.002	.006	.009
" 20 " 25	+.010	+.009	0	+.002	.007	.010
" 25 " 32	+.011	+.010	0	+.002	.008	.011
" 32 " 40	+.012	+.011	0	+.002	.009	.012

Shaft or Equivalent: Plus allowance. Turned or ground on centers.
Hole: Bored.
Example Application: Steel couplings for heavy duty, such as steel mill drives, Diesel engines, elevator rope sheaves, solid steel hubs, etc.



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ORNAMENTAL HARDWARE

SHEET METAL SLITTERS

The three widely diversified finished products mentioned above have one point in common. They were produced with the aid of our tool steels cast to shape. This emphasizes again the point which we continually stress—no matter what the industry or how diverse and exacting its requirements, one of our specialized tool steels can meet them with the utmost efficiency and economy.

Included in our complete line are Krokoloy, Martin Steel and Castaloy—all three alloy tool steels cast to shape and hardened in still air, and Carbomang, an oil hardening tool steel cast to shape for purposes where alloy steel castings are not required. Our service includes full co-operation on your die castings and machine tool problems. Write for complete series of illustrated literature.

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TABLE 8
BUMPING FIT—STANDARD

Nominal Diameter	Turn		Bore		Interference	
	Max.	Min.	Min.	Max.	Min.	Max.
Above 1 to 5	+.001	+.0005	0	+.0005	0	.001
" 5 " 10	+.0015	+.001	0	+.001	0	.0015
" 10 " 20	+.002	+.0015	0	+.001	.0005	.002
" 20	+.003	+.0025	0	+.001	.0015	.003

Shaft or Equivalent: Plus allowance. Turned or ground on centers.
Hole: Up to 5 in. diameter holes are based on selected reamers, except coupling recess. Above 5 in. diameter holes are bored.
Example Application: All applications, where the hub may have to be dismounted without having a hydraulic press available.
Coupling pilot and recess.

TABLE 9
BUMPING FIT—SPECIAL

Nominal Diameter	Turn		Bore		Interference	
	Max.	Min.	Min.	Max.	Min.	Max.
Above ½ to 1	0	—.0005	—.001	—.0005	0	.001
" 1 " 2	0	—.001	—.0017	—.001	0	.0017
" 2 " 4	0	—.001	—.002	—.001	0	.002
" 4 " 8	0	—.001	—.0025	—.001	0	.0025

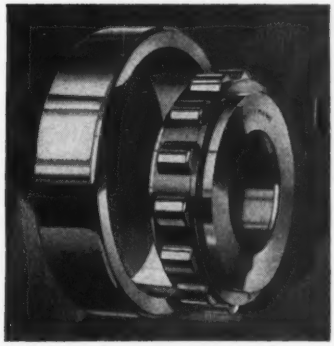
Shaft or Equivalent: Minus tolerance as used for shaft extension. Turned or ground on centers.
Hole: Coupling or Pinion, special reamer up to 1 in. diameter hole. Bored above 1 in. diameter hole.
Example Application: Couplings, Pinions, Pulleys for general purpose—Industrial Motors, where solid brackets may have to be dismounted.

TABLE 10
LIGHT PRESS FIT

Nominal Diameter	Turn		Bore		Interference	
	Max.	Min.	Min.	Max.	Min.	Max.
Up to ½	+.0005	+.0003	0	+.0002	.0001	.0005
Above ½ to 1¾	+.001	+.0007	0	+.0005	.0002	.001
" 1¾ " 2¾	+.0015	+.001	0	+.0005	.0005	.0015
" 2¾ " 4	+.0025	+.002	0	+.001	.001	.0025
" 4 " 5½	+.003	+.0025	0	+.001	.0015	.003
" 5½ " 7	+.0035	+.003	0	+.0015	.0015	.0035
" 7 " 9	+.004	+.0035	0	+.0015	.002	.004
" 9 " 12	+.0045	+.0035	0	+.0015	.002	.0045
" 12 " 16	+.005	+.004	0	+.0015	.0025	.005
" 16 " 20	+.0055	+.0045	0	+.002	.0025	.0055
" 20 " 25	+.006	+.005	0	+.002	.003	.006
" 25 " 32	+.007	+.006	0	+.002	.004	.007
" 32 " 40	+.008	+.007	0	+.002	.005	.008

Shaft or Equivalent: Plus allowance. Turned or ground on centers.
Hole: Up to 2¾ in. diameter holes are based on selected reamers. Above 2¾ in. diameter holes are bored.
Example Application: Cast iron couplings, steel couplings for general industrial applications, gears and pinions (heavy duty), cast iron hubs, split hubs.

WHERE NO OTHER TYPE OF BEARING WILL



STAND UP

Because of Extreme Load Conditions, Use

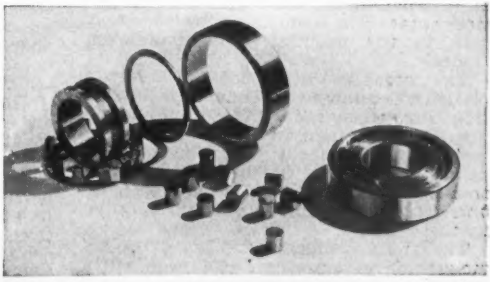
PRECISION ROLLER BEARINGS

With the Heavy Bronze Cage

Picture to yourself the most difficult load conditions a bearing can be called upon to meet—high speed, heavy load, temporary overloads, shock, vibration. Then read, in the adjoining column, how NORMA-HOFFMANN Precision Roller Bearings—time-tested heavy-duty units—meet these conditions.

• • •

And remember—PRECISION Roller Bearings interchange in size with all standard ball bearings. They can be had—in addition to the standard type here illustrated—in one-lip, two-lip (self-contained), full roller type (without cage), self-aligning and adapter types.



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Solid cylindrical rollers between cylindrical races providing maximum load contact area, insuring steady load capacity, and a larger shock-absorbing capacity than any other type of single-row bearing.

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A margin ample for temporary overloads up to 80% beyond normal rating, as under peak loads, in unusually severe duty, or under shock conditions.

SUPERIOR CAGE

Made of extruded bronze to secure maximum density and uniformity—machined all over for balance—riding on inner ring lands or shoulders, relieving the rolling elements of its weight.

EXTREME ACCURACY

Rollers held to .0001 inch on diameter and to .002 inch on length, throughout—absolutely true rolling surfaces, ends absolutely square with the sides—highly finished, quiet, friction-free.

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Uniform contact throughout the length of the rollers, providing the most efficient load distribution—greater wear-resisting surfaces—true rolling between all load contact areas—minimum friction between roller and cage.

SPEED QUALITIES

A lower friction coefficient under heavy load than any other type of bearing—a speed ability equal to that of any ball bearing, size for size, up to 35,000 R.P.M.

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There's no duty too hard for a PRECISION Roller Bearing. And, for the less exacting duties, there are PRECISION Ball and Thrust Bearings. Write for the Catalog—or ask our engineers for suggestions.

"NORMA-HOFFMANN"

PRECISION BEARINGS

BALL, ROLLER AND THRUST

NORMA-HOFFMANN BEARINGS CORPORATION, STAMFORD, CONN., U. S. A.

TABLE 12

SHRINK FIT—(STEEL ONLY)

Nominal Diameter	Turn		Bore		Interference	
	Max.	Min.	Min.	Max.	Min.	Max.
Above 1½ to 2	+.002	+.0015	0	+.0007	.0008	.002
" 2 " 2½	+.0025	+.002	0	+.001	.001	.0025
" 2½ " 3¼	+.0035	+.003	0	+.0015	.0015	.0035
" 3¼ " 4	+.004	+.0035	0	+.0015	.002	.004
" 4 " 5	+.0045	+.004	0	+.0015	.0025	.0045
" 5 " 6	+.005	+.0045	0	+.0015	.003	.005
" 6 " 8	+.006	+.005	0	+.0015	.0035	.006
" 8 " 10	+.007	+.006	0	+.002	.004	.007
" 10 " 12	+.008	+.007	0	+.002	.005	.008
" 12 " 14	+.010	+.009	0	+.002	.007	.010
" 14 " 16	+.012	+.010	0	+.002	.008	.012
" 16 " 18	+.014	+.012	0	+.003	.009	.014
" 18 " 20	+.016	+.014	0	+.003	.011	.016
" 20 " 22	+.018	+.016	0	+.003	.013	.018
" 22 " 25	+.020	+.018	0	+.003	.015	.020
" 25 " 28	+.022	+.020	0	+.003	.017	.022
" 28 " 32	+.024	+.022	0	+.003	.019	.024
" 32 " 36	+.027	+.024	0	+.003	.021	.027
" 36 " 40	+.030	+.027	0	+.003	.024	.030

Shaft or Equivalent: Plus allowance. Turned or ground on centers.
Hole: Bored.
Example Application: Fly wheels, shrink rings.

National Metal Trades Association Sponsors Machine Shop Course

The National Metal Trades Association has announced the publication of "Machine Shop Technology"—a unit course of instruction for students and apprentices engaged in acquiring knowledge and skill in the machinist and toolmaker trades.

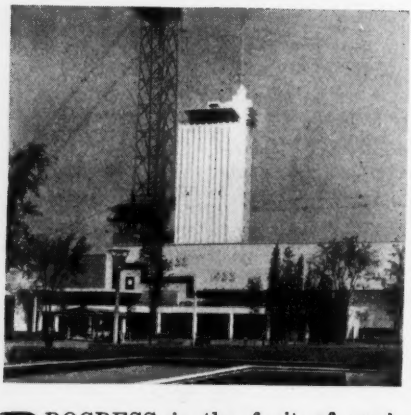
The course was developed by the association's Committee on Industrial Education, assisted by more than one hundred practical shop men and a group of well-known trade school instructors. The course is suitable for use in company training programs or in public schools offering practical or related instruction in these trades.

The group comprises 226 lesson units, amounting to more than 1,000 pages with more than 600 illustrations. It is divided into six sections, as follows: Part I, Hand Tools, Measuring and Recording Instruments. Part II, The Engine Lathe. Part III, The Milling Machine. Part IV, The Cylindrical Grinding Machine. Part V, The Shaper. Part VI, The Turret Lathe.

The scope of the work may be realized when it is known that the section dealing with the engine lathe and its functions includes 72 separate lessons; 21 lessons dealing with the design, operation and function of the various parts of the lathe; 29 lessons dealing with the various kinds and types of operations that are and can be performed in the lathe and 22 lessons each of which gives the student an actual task to perform. By the time the student has completed this series of lessons there will be nothing about the engine lathe with which he is not familiar—and the same may be said for the other five parts of the course.

The course is available to the public either in complete sets including the "Instructor's Manual", or by sections as desired. Complete sets are priced at $8.00 and the individual sections may be had at prices ranging from 80 cents to $3.00, depending upon the section desired. Post binders for the lesson sheets are also available.

The material is available through A. L. Pierce, Director, Department of Industrial Relations, National Metal Trades Association, Peoples Gas Bldg., Chicago, Ill.



The "Century of Progress"

Is Best Appreciated By The Engineer

PROGRESS is the fruit of engineering. To the engineer—mechanical, electrical, or chemical—can be credited the development of the materials and mechanisms that form the basis of our modern civilization. Consequently the engineer, more than anyone else, is able to appreciate the scientific exhibits at the "Century of Progress" Exhibition now open to the public at Chicago.

The engineer who visits the Exposition will be in his glory in the Hall of Science. He will find that the builders of the fair have reached into far and strange places to gather materials for this unique and inspiring exposition. They have stretched their hands back 10,000 years into the dim past. They have made visual the dark depths of the sea, and have mingled the products of the arctics with those of the equator.

He will see smiling scientists conjuring with various kinds of invisible waves and rays, and performing seeming miracles with sound and light. Machines that seem to think are made to perform astounding varieties of magic. It is a rather staggering series of exhibits, taken as a whole, but when analyzed one by one the picture becomes orderly and quite understandable.

One single display is the result of collaboration by forty universities, laboratories, governments and companies. This is the exhibit of the 92 elements which go to make up the world and all that's in it. Arranged in groups and labeled as to names and numbers, it comprises a fascinating feature.

Those who are more scientifically-minded will be interested in the "hodoscope." This is an instrument recently invented, which makes visible the cosmic ray and enables the observer to count the rays as they strike. Among other recent discoveries of science on display are heavy hydrogen and heavy water, hailed by scientists a few months ago as very important finds.

Universities, laboratories, museums, hospitals, scientific organizations, groups, and industries have cooperated to tell in graphic manner a large variety of amazing scientific facts. Use is made of motion and sound pictures, mechanics, art diaramas, models, chemicals—every conceivable thing that can be used for visual demonstration.

Physics is given special attention. Molecular physics are pictured as they have to do with gases, liquids, and solids; electrostatics, magnetism, in-

duction; the generator, transformer, vacuum tubes, radio, light, color, and energy.

Mathematics, which is involved in every realm of science, has a large place in the Hall of Science. Every effort is made to illustrate with utmost clarity such mysteries as link motion, the workings of the slide rule, the Barnett gyromagnetic effect, the Galton quincunx, the computation of pi, the fourth dimension, Einstein's theory of relativity, and other puzzlers to the "average" mind.

Days could be spent in the Science Motion Picture Theatre alone. Just a few of the motion pictures, with sound, shown at regular intervals are:

Chemistry and Physics—Oxidation and reduction of ores; the blast furnace, and thermite welding; the molecular theory of matter, with animated drawings and micrographic pictures.

Biology—Plant growth, flowers at work, seed dispersal, the physical development of birds, bugs, beetles, insects, and animals, shown with time-lapse, micro-photographic, and stop-motion pictures. Biology carries the observer through the varied story of life, beginning with the single cell and including embryology, the structure and function of the human organs, the distribution of living creatures, their classification, and so on.

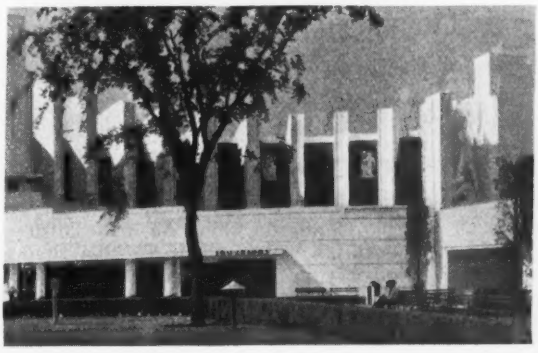
Geology—The ceaseless procession of building up and tearing down the earth's crust. Geology brings the story of the formation and development of the world. The story starts a billion years ago and includes everything from tiny horses to giant pigs—both long extinct.

Medicine—Man against microbes; the dramatic fight against disease germs. Man's never-ending battle with microbes and other destroyers; the discovery of the value of anaesthetics and sterilizing agents, and his wonderful work in perfecting surgery are vividly pictured.

Astronomy—A motion picture journey to the moon, sunrise and sunset in lunar craters; a solar eclipse portrayed by actual pictures.

The Electrical Building is also of especial interest to the manufacturing executive. In this exhibit is a model factory building containing electrically-operated equipment and demonstrating various applications of electric heat. The equipment in this model plant includes a minute heat treating furnace equipped for magnetic control of temperatures, an indirect arc type melting furnace, and other examples of modern equipment.

The reader-audience of MODERN MACHINE SHOP forms probably the largest single group of men who are able to appreciate to the fullest extent the educational value of the exhibits in these buildings, and it is for this reason that these interesting exhibits are brought again to the attention of our readers, together with the recommendation that everyone who possibly can should see them. For many of us, the opportunity will not come again.



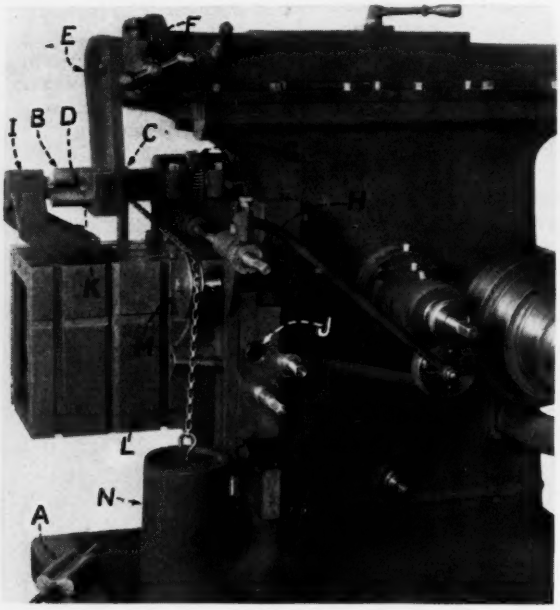
IDEAS FROM READERS

This department is a clearing house for ideas . . . If there is a "kink" or short cut in use in your shop, send in a description of it . . . Each one published will be paid for.

Machining Pump Impellers in the Shaper

By Avery E. Granville

AN UNUSUAL shaper set-up for machining pump impellers is shown in the illustration. The fixture



Machining a Pump Impeller in the Shaper

is so designed that, after the job has been set up and the machine started, the operation is practically automatic. The only adjustment required is the re-setting of the cutting tool for the finishing cut after the roughing cut has been taken.

The impeller is made in one piece from a steel casting or forging. After the ends have been centered, the shaft ends are turned and faced in a lathe, the keyways are cut in the shaft, and the body is roughed approximately to form in a milling machine. The piece is then placed in the fixture shown set up on the shaper and is finished to size and shape. A little scraping or hand-work with abrasive cloth is sometimes needed in the final fitting and assembling to insure a close fit and smooth operation.

A finished impeller is shown at **A** and another can be seen in position in the machine at **B**. A master form, keyed to the impeller shaft, is visible at **C**. As the shaper ram reciprocates, the feed mechanism **H** operates a worm and worm wheel **G**, thus revolving the work-spindle and with it the master form **C**. The arm **E**, which is bolted to the tool-slide **F** on the shaper ram, carries a ball-shaped roller and the disc-shaped cutting tool **D**, the tool being held in a small clapper box as shown. The ball-shaped roller is in contact with the master form; thus as the work-piece

revolves, the roller governs the movement of the tool. As can be seen, the toolslide **F** is set cross-wise so that it can be used to feed the tool in and out. The outer end of the work-spindle is supported by a bracket and bearing at **I**.

To provide for free movement of the table in order to keep the guide roller and master form in contact, the screw for the table cross-feed has been removed as shown at **J**. A steel bar **K** is bolted to the shaper table and the chain **L** is attached to it. The chain runs over the grooved roller **M** and supports the weight **N**, which exerts the necessary tension to keep the master form and guide roller in contact as the machine operates.

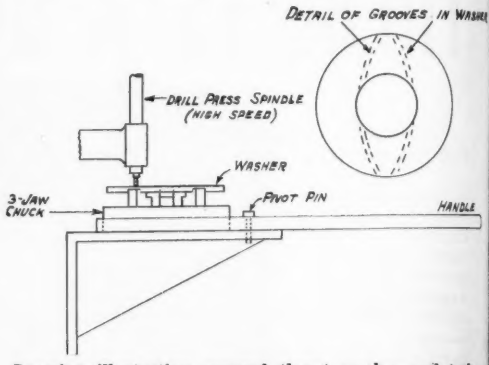
Cutting Oil Grooves in Brass Washers

By F. L. Pyle

WE MAKE a great many brass thrust washers, of a type that has oil grooves cut in both sides. The tools used in cutting the oil grooves are of simple design, and may be interesting to the other readers of your magazine.

The washer is held for grooving in a three-jaw chuck that is located on the table of a small high speed drill press. To the chuck is attached a handle which is pinned to the machine table by a pivot pin, as shown in the illustration. As the chuck is free to slide on the table, it can be moved back and forth by means of the handle. The cutting tool is a short twist drill, ground slightly flat at the cutting edges and round at the nose, so that it will make a round-bottom channel for conveying the oil.

The washer is held in the chuck and the stop on the drill spindle is set so that the drill will cut a groove of the correct depth. With the drill cutting at full depth, the handle is moved so as to feed the washer across under the drill with a circular motion, cutting a slightly curved groove as shown in the illustration. It is our opinion that the curved groove is better than a straight one for the distribution of lubricant. When one side



Drawing illustrating grooved thrust washer and tools for grooving.

of the washer is grooved, it is turned over and the other side is grooved.

The drill should be run at very high speed; thus a smooth groove is produced, and the operation is quickly completed.

Adjustable Radius-Turning Tool for the Lathe

By Halvor Anderson

THE drawing shows the design of an unusually interesting radius-turning tool for the lathe, and the photographs show the use of the tool and some of the work that has been done with it. The radius is cut with a single point tool, the toolbit being

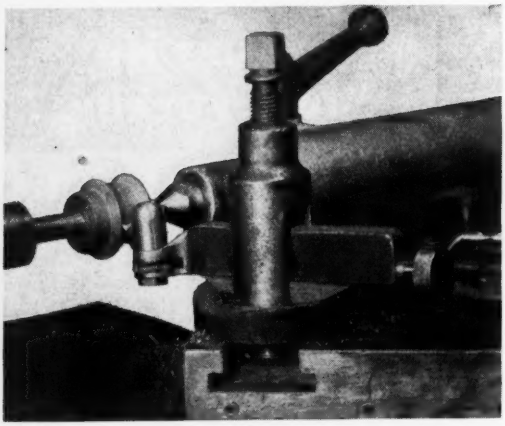


Fig. 1—Adjustable Radius-Turning Tool in position for turning a small spool-pulley.

held in a revolving head that is controlled by means of a crank handle at the rear end of the holder. Radii from ⅜ in. to 1¾ in. can be turned with this tool, the setting for the desired radius being obtained by measuring with a micrometer from the tip of the tool to the opposite side of the head and then subtracting half the diameter of the head, in the usual manner.

The shank of the tool, or holder, is ½ x 1 1/16 in. x 6¼ in. long, as shown in the drawing. The revolving head is offset from the holder so that teeth cut in the head can mesh with a worm-thread on the end of a shaft that extends through the holder. When the crank handle is turned by the operator, the power thus applied

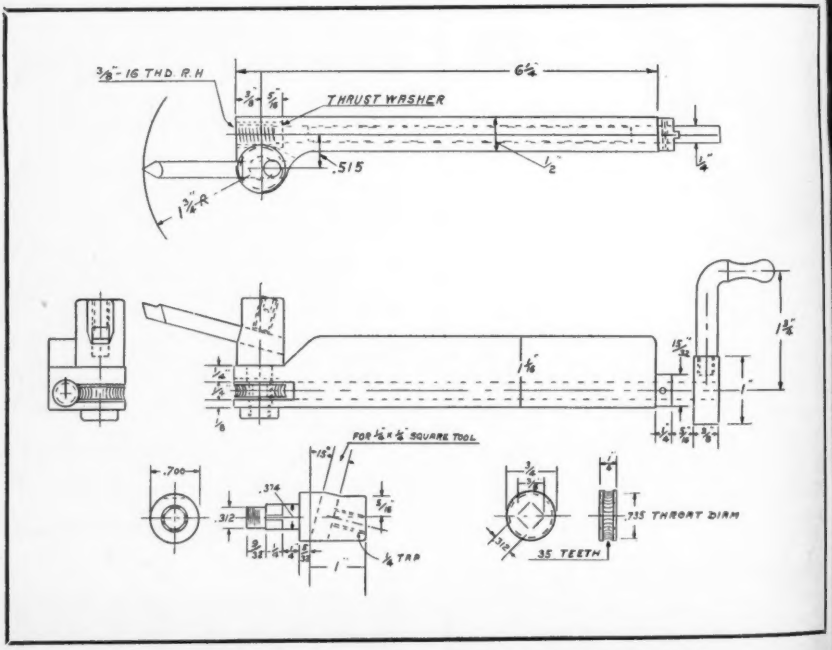


Fig. 2—Drawing of Adjustable Radius Turning Lathe Tool

is transmitted through the shaft to the revolving head, swinging the point of the tool as required.

The holder is of cold drawn steel, cyanided, and the head is of tool steel. The shaft is also of soft steel, so that if undue tension is somehow brought to bear on the tool and strain is placed on the gears, the thread on the shaft will give and the teeth on the head will be saved. The slot in the head is made for a ¼-in. square toolbit.

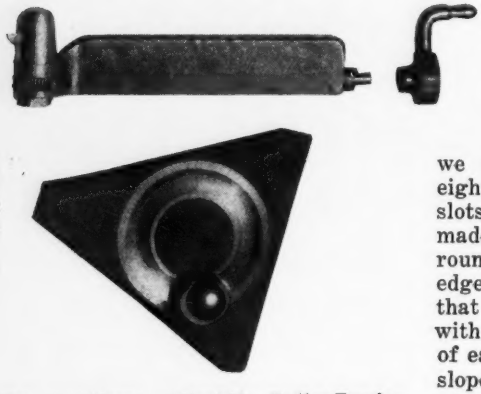


Fig. 3—(Above) Adjustable Radius-Turning Tool with Crank Handle Removed. (Below) Ball Race Made with This Tool.

The illustration Fig. 3 shows the tool with the handle detached and also shows a finished ball-race that was cut with the tool.

Making Ball Clutches on a Drilling Machine

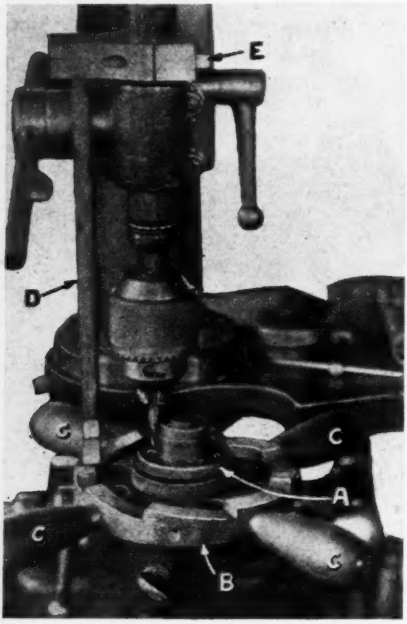
By Paul A. Bard

MAKING the plates, or disks, for holding the balls in small ball-clutches isn't hard when a device similar to the one shown is used. Ours is not precision machinery and we do not have to make parts in large lots, so many of our jigs and fixtures might seem rather crude to some. However, they help us "get by" at a profit while others who put too much time and money into expensive tools frequently do not.

Every mechanic is familiar with some form of ball clutch, where one or more steel balls are used in sloping slots so that when the clutch is engaged, the balls press against an opposing plate which is driven when the drive shaft and ball disk move in one direction and released when the drive shaft is stopped or runs in the opposite direction. In our case we use a three-inch disk carrying eight ¼-in. steel balls. The sloping slots in which these balls work are made with a 9/32-in. drill, ground rounding on the end. The cutting edges are ground as for brass work; that is, straight across and parallel with the axis of the drill. The deep end of each slot is made 5/16-in. deep and slopes up to nothing on the other end, which runs close to the deep end of the next slot. This gives the balls a sharp enough slope, or rise, so that they grip well but have no tendency to wedge when the shaft is reversed or stopped. When a quick release is desired, this wedging tendency always has to be allowed for in a clutch of this kind.

The ball-holding disk of the clutch to be slotted is placed in the fixture as shown at **A**, and is held on the fixture-spindle by a screw-on locking ring and a key which fits a keyway cut in the disk. The master guiding ring, **B**, has eight sloping steps, or rises, corresponding in slope and spacing to the slots that are to be cut in the ball-disk of the clutch. Four convenient wooden handles **C** make it easy for the operator to turn the master ring and work, as he works the drill spindle lever. A heavy steel rod

D, set into a steel bracket E, is clamped to the drill spindle sleeve as shown. The lower end of this guide rod contacts the rises of the master ring and



Ball-clutch Milling Fixture for a Drill Press

thereby governs the depth to which the drill cuts into the ball-disk in the fixture.

In roughing out the sloping slots, the operator uses the shortest drill he can so as to avoid all the spring possible, and he proceeds to work the drill straight up and down as he gradually turns the master ring and works by means of the wooden handles. This not only automatically spaces the slots, but governs the entire depth from the deep end to the "vanishing point" at the top of the slope. This method of working the spindle of the drilling machine up and down avoids springing the guiding rod and the drill itself under the heavy pressure of the roughing cuts.

When well roughed out all around, the slots are smoothed out by speeding up the drill and steadily turning the work. Final finishing is done by putting a round stick of Carborundum in the chuck and running the drill spindle at the highest speed possible, working the master guide around in steady movements on each slot in turn. The end of the Carborundum stick is, of course, first rounded to the exact shape of the finished slots, so as to give a smooth, well rounded set of slots for the balls to work in nicely.

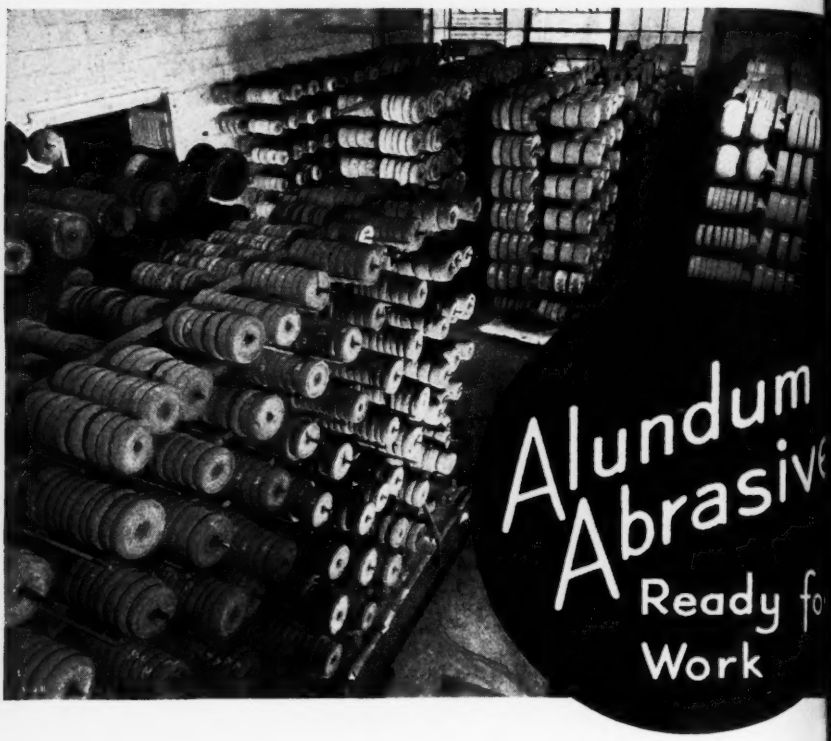
Jig for Drilling Peripheral Holes

By Charles Kugler

THE drill jig shown in the illustration was designed by the writer for use in drilling holes in washers for holding roller bearings. The principal feature of the jig is that the bushing plate can be adjusted to permit the drilling of work of varying thicknesses, and, by using bushings of different lengths, of different diameters. As can be seen by reference to the drawing, the jig was constructed largely by the welding process.

The jig consists primarily of the base A, to which is attached the supporting plate B which, in turn, carries the shaft G and the index plate E, and also the bushing plate K.

The foundation of the jig is the base A, which rests on four hardened steel feet. Rising from the base is the supporting plate B, through the center of which extends the shaft G. The shaft carries the index plate, E, at the rear end, and the front end is conditioned to provide for quickly attaching the work-piece. To prevent



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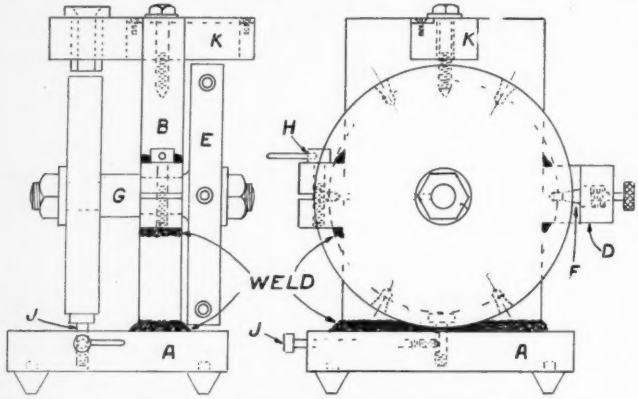
G-16

the work from rotating under pressure of the drill, the supporting plate **B** is slotted and the shaft is locked by means of the locking screw **H**. The plate **B** also carries the block **D**, the center of which is in line with the center of the shaft **G**, and which is made to extend over the edge of the index plate **E** so that the plunger **F** can slip into position in the holes in the index plate.



Design of Jig for Drilling Peripheral Holes

To the top of the supporting plate **B** is attached the bushing plate **K**, carrying the bushing. The bushing plate slides in a square slot cut in the top of the supporting plate, so that it can be adjusted according to the widths of different sizes or thicknesses of work-pieces. The bushing plate carries a scale that enables the bushing to be set at a given distance from the edge of the work, or to be adjusted so as to bring the hole in the center of the work.

As designed, the shaft **G** was turned on the end to fit the hole in the smallest piece of work for which the jig would be used, and split bushings were provided to make the shaft fit larger holes. A spring jack **J** can be used to support the work so that the pressure exerted by the machine spindle will not be brought to bear on the shaft **G**. A jig of this design, with variations, can be used for a wide variety of work.

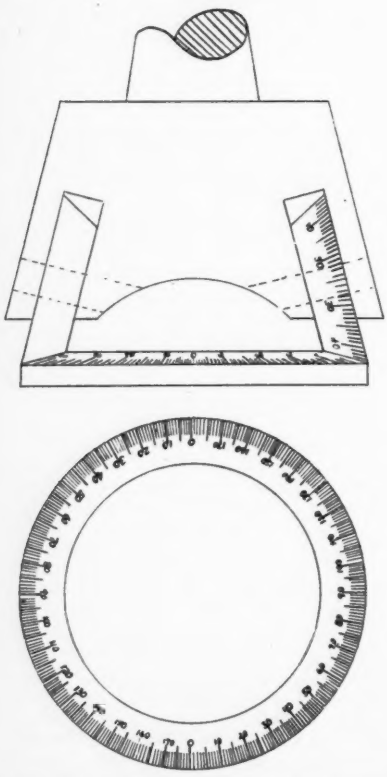
Simple Method of Graduating

By F. B. Helander

BEING confronted recently with the problem of graduating a number of cast iron compounds which

were so constructed that it was impossible to mark the graduations with a flat die in a press, we finally decided to graduate them by the rolling method.

A fixture was designed as shown



Design of drill press tool for graduating work.

to fit the spindle of a drill press. The head contained two rolls, set at the same distance from the center, one of the rolls being graduated as shown and the other blank. By applying leverage to the spindle, the graduated roll was forced down heavily enough to reproduce the graduations in the work, and the blank roll evened the flare so that a neat appearing job was obtained accurately and quickly.

Cutting Threads on Fibre

A SOLUTION to one of the problems which has puzzled many turret lathe operators is given by C. S. Stilwell, sales manager, the Warner & Swasey Co., machine tool and precision instrument builders, Cleveland.

One of the company's demonstrators was doing some work in the machine shop of a nationally known concern and found that the best operators had been unable to cut a clean thread on some fibre material. A die head was used but the thread would break or chip, and the job would not pass inspection. Other operators tried the job. Chases were reground and a variety of lubricants were tried.

The solution came when one inquiring operator found that the fibre material was stored in the stockroom way up by the ceiling and became, as a result, very dry. By putting the material out of doors overnight so that it would gather moisture, it was found that perfect threads could be cut. The overnight seasoning did the trick.

LANDIS CATALOG No. H-34, issued by the Landis Tool Company, Waynesboro, Pa., and describing the Landis Type B Hydraulic Roll Grinding Machines, is now available. The booklet contains twelve pages of description of the Landis 16-in., 20-in., 24-in. and 28-in. sizes, especially designed for the grinding of the smaller diameters of rolls. The machine is fitted to grind roll bodies either straight, concave, or convex, and is especially recommended to the strip metal industry where the 20-in. machine would be the one generally required.

A copy of the catalog will be sent to any mechanical executive upon request.

Over the Editor's Desk

The Engineer

ON another page of this magazine is an article calling attention to the amazing array of exhibits to be found in the Hall of Science at the "Century of Progress", and recommending that every one of our readers who can do so should see it. The article is seemingly addressed to "engineers", consequently the question arises as to just what we mean by engineers, and why we think that the engineer is so important to humanity.

Webster says that an engineer is "one who carries through an enterprise by artful contrivances." The inference is that the person who is carrying through the enterprise must be capable; by what process he has acquired the knowledge that makes him capable is beside the point. Whether he has acquired his academic training first and his experience afterward or the other way around is immaterial. Some of the best engineers today are men who obtained at least a part of their experience first and their "book learning" afterward—usually by burning the midnight oil.

Pioneers in the art of working metals attained their results, not by virtue of scientific knowledge, but by hard experience. The engineer's skill was built on a foundation of results, not of causes. The modern engineer, on the other hand, lays his plans according to his knowledge of causes and thus obtains the results he seeks. He is not satisfied with results; he must know what the causes are so that the results can be controlled as he wishes.

To the engineer can be credited the tools by which the normal span of life has been extended and made more liveable. In putting electricity to work the engineer has tapped the very source of life itself and has harnessed the energy by which the universe is heated, lighted, and controlled. The engineer has devised tools by which we can accomplish otherwise impossible tasks. Modern machines have enabled us to conquer the air, the sea, and the elements.

Household and industrial tasks that formerly were performed by dint of hard labor and unsanitary methods have been rendered easy and clean due to the development of machinery. The average life of human beings has been extended from the 45 years of half a century ago to the 58 years of today—to a certain extent through the efforts of the engineer.

It would seem that the engineer has reached the point where he requires only to know what the world needs and he will produce it. But now that he has reached that point, he is confronted with another task; one which may not be so easy.

Within a span of some forty years the world has been given more time and labor saving tools than it had ever had before all put together, but it has failed to realize their possibilities. The engineer must now become the salesman. He has given the world the opportunity for a better civilization; a higher plane of living; more time for physical and mental development. With the proper management all of these things are possible, but it now seems that the engineer will also have to show the world how to use these advantages. Having presented the world with scientific servants, he is now confronted with the task of showing the world how to control them so as to obtain the fullest possible benefit.

NEW SHOP EQUIPMENT

Norton 16-In. Type C Cylindrical Grinding Machine

A 16-in. Type C cylindrical grinding machine has been announced by Norton Company, Worcester, Massachusetts. In general design it is quite similar to the 10-in. Type C line announced last December, although considerably larger and heavier in every detail.

It is offered as a motor driven machine only, the grinding wheel spindle being driven by an individual motor mounted directly on the wheel-slide. Likewise, the headstock is driven from an adjustable speed direct current motor mounted on the unit while a third motor drives the pumps and table traversing mechanisms.

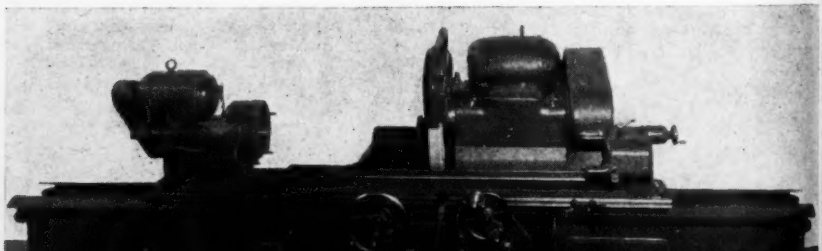
The machine will swing 16½ inches over the table and mounts either a 30 in. or 36 in. diameter grinding wheel. It is built in lengths of 36, 48, 72, 96, 120, 144, 168 and 192 inches, and is offered either with hydraulic table traverse or mechanical traverse. If desired it can also be supplied as a hand traverse machine. The headstock weighs approximately 950 pounds, has better than a 19 in. long bearing on the table and mounts a 1¾ in. diameter center. The footstock weighs over 200 pounds, has a 14¾ in. length bearing on the table and also mounts a 1¾ in. diameter center.

One of the particular features of the machine is the grinding wheel unit, which weighs nearly 3400 pounds complete. The grinding wheel spindle is made of heat treated alloy steel and is over 42 inches long. The large bearing is 4¼ inches in diameter x 10⅛ inches long while the small bearing is 3⅞ inches diameter x 8½ inches long. Both bearings are flood lubricated, the oil passing through a filter just before it enters the bearings. Three spindle sheaves are furnished as standard equipment, the change from one speed to another being made as easily as changing grinding wheels. V belts are used for the drive from the motor to the spindle, there being no idlers or intermediate shafts.

The base ways are 3½ inches wide, one being flat and the other vee and have an overall width of 16½ inches. Both the base ways and the wheel-slide ways are forced-feed lubricated.

Table speeds for hydraulic traverse machines range from 6 inches per minute to 22 feet per minute and on mechanical traverse machines from 7½ inches to about 9½ feet per minute.

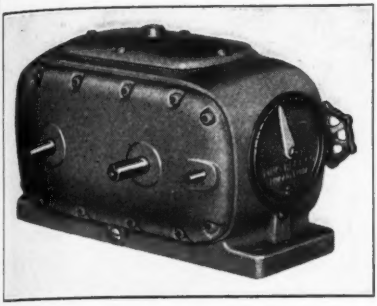
The machine weighs, complete with motors, approximately 13,000 pounds for the 36 in. length and 26,000 pounds for the 192 in. length. It requires a floor space from about 7½ feet in width (8½ feet when a hydraulic wheel head traverse mechanism is supplied) by lengths ranging from 12 feet for the shortest machine to 38 feet for the longest.



Norton 16-In. Type C Cylindrical Grinding Machine

Link-Belt Variable-Speed Transmission for Fractional Horsepower Duty

A novel self-adjusting, positive variable-speed transmission for fractional horsepower duty, known as the Link-Belt V.R.D. (Variable Roller Drive), is being announced by Link-Belt Company, 912 S.



Link-Belt Variable-Speed Transmission for Fractional Horsepower Duty.

Michigan Ave., Chicago, as a companion to their P.I.V. Gear variable speed transmission announced about 5 years ago for larger capacities.

The V.R.D., which is capable of a horsepower output of ½ h. p. at maximum speed, with a maximum ratio of speed variation of 10 to 1, continues such features as compact all-metal construction, total enclosure, self-lubrication in an oil bath, protection from moisture and grit, and the use of a chain for transmitting the power positively.

Novelty in the V.R.D. consists in the construction and application of the chain which is used for transmitting the power from input to output shaft. It is side-contact roller chain, consisting of steel links, made endless and connected by hardened steel pins in hardened steel joint bushings.

Openings in each pitch of links provide a pocket for each of two hard steel rollers, and from both sides a portion of roller protrudes sufficiently to permit each pair of chain rollers, at each engagement of chain and wheels, to roll into contact with the hardened steel conical opposed discs forming the driver and driven wheels, until finally the chain is engaged positively in the wedge-shaped wheels at the proper pitch line for the speed desired on the output shaft. The disengagement of chain also takes place with a smooth, rolling action.

A speed indicator permits ready check-up on operating speed settings. Spring pressure applied to the two discs of one wheel serves to maintain correct tension and compensate for natural chain wear automatically.

The V.R.D. is furnished with horizontal or vertical box; with or without reduction gearing; and can also be supplied motorized, with motor forming an integral part of the unit.

American No. 650 Welding Helmet

The No. 650 welding helmet developed by the Safety Engineering Bureau of American Optical Company, Southbridge, Mass., is particularly suited for work in confined spaces such as tanks, ship hulls, locomotive front ends, fire boxes, and other places of a similar nature.

Designed to fit closely to the face and sides of the head without sacrificing ventilation or causing light leaks, the helmet is cool and comfortable under the most humid conditions. The Bakelite welding glass holder is outside of the helmet and is fully dielectric. It assures the wearer of freedom from burns if accidental contact is made with the electrodes while working. The added distance from the face to the welding plate permits the helmet to be comfortably

American No. 650 Welding Helmet

worn with a respirator and also helps to prevent fogging. Noviweld glass, which screens out more than 99½% of all injurious light rays, is standard equipment.

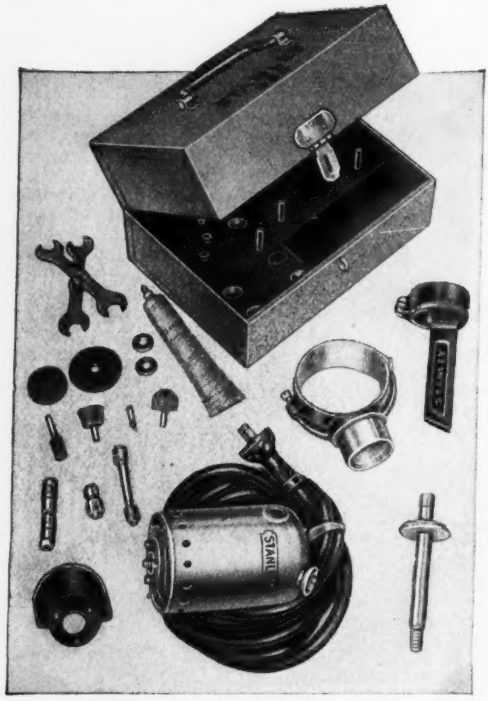
A swivel connection between the helmet and headgear provides three positive positions in which the helmet can be set when in use. Looseness, slipping and

sideplay are eliminated. The entire unit is extremely light in weight and the balance between the headgear and the helmet increases the speed and positiveness with which the helmet can be set in position.

American Optical Company has prepared an illustrated folder describing the new 650 Welding Helmet which they will be glad to send to anyone interested. Address: American Optical Company, Southbridge, Massachusetts.

Stanley Toolroom Grinder No. 585

Stanley Electric Tools, New Britain, Conn., has brought out a toolroom grinder—the No. 585—which is said to be capable of innumerable uses. With the grinder mounted in a lathe, shaper, milling machine, planer, or in a special Stanley bench stand, a variety of abrasive wheels—either straight or mounted—may be used to grind openings in dies and jigs of all kinds, or keyways, slots or other apertures.



Stanley Toolroom Grinder No. 585 with Accessories

The tool can also be used for many other kinds of external and internal grinding operations. As a hand tool it can be used to grind machine parts and for rough grinding on small castings or forgings. With a metal cutting bit it can be used to machine aluminum patterns, brass templets, and for similar work on all non-ferrous metals.

The Stanley Toolroom Grinder is equipped with a ⅜ h.p. 18,000 r.p.m. Universal motor, and will drive a 1½x½ in. wheel under considerable pressure. The grinder is furnished complete with motor unit holders, wheels, bit wrenches, and lubricant as illustrated. These accessories, together wtih motor unit, fit into a compact metal carrying case which keeps the unit together for storing or carrying from job to job.

Portable Brinell Testing Instrument

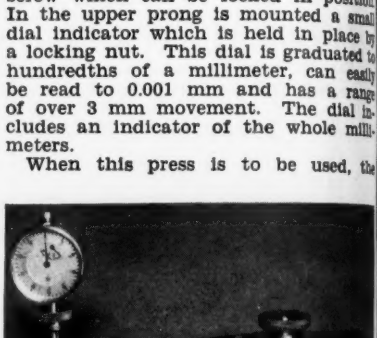
A new form of portable testing instrument for making readings of Brinell hardness numbers is being placed on the market in this country by the R. Y. Ferner Co., Investment Building, Washington, D. C. By the use of three sizes of steel balls furnished with the outfit and different pressures, it is possible with this equipment to measure the hardness not only of steels, cast iron and hard bronzes but also the softer metals, including lead and copper.

This Brinell press is designated as Type M 60/750, the figures representing the range of pressures in kilograms that can be used with the instrument. It consists of a tapered piece of steel seven inches long and weighing about 34 ozs. which is slit, by sawing, from the smaller end to within three-quarters of an inch of the larger end. In one surface of the larger end is inserted a holder with a steel ball of which three sizes are furnished of 10 mm, 5 mm and 2.5 mm diameter. In the opposite side may be inserted any of three threaded holders. One of these has a spherical top for use of the press between the jaws of a vise or in an arbor press for applying the pressure. The second is a Morse Cone No. 2 to hold the instrument in a drill press. The third is a square holder, half an inch square in cross section, for insertion in the tool post of a lathe, to

make tests of pieces while they are mounted for machining.

In the lower of the two prongs, at the small end, is mounted an adjustable screw which can be locked in position. In the upper prong is mounted a small dial indicator which is held in place by a locking nut. This dial is graduated to hundredths of a millimeter, can easily be read to 0.001 mm and has a range of over 3 mm movement. The dial includes an indicator of the whole millimeters.

When this press is to be used, the



Portable Brinell Testing Instrument

adjustable screw is set against the contact plunger of the dial indicator so that the latter reads zero with no load applied, and is then locked in that position. Then the steel ball in the opposite end is placed against the piece to be tested, either in the jaws of a vise or under the spindle of a drill press or on a lathe, and the pressure is applied until the dial indicator shows by its reading the position of the adjustable screw with reference to the upper prong corresponding to the pressure desired. This position is given by a chart furnished with the instrument showing the calibration of the dial for the different loads that would ordinarily be used. The ratio of readings of the dial indicator to increments of load is practically linear and amounts to about 0.0018 mm per kilogram. The press contains a device to prevent overloads greater than 10 per cent.

For reading the diameter of the impression made by the ball, a special magnifier having a cam-shaped dial is supplied with the outfit. This dial also shows the corresponding Brinell number for the 750-Kg load when using the 5-mm ball. The dial also has a scale of tensile strength of steel in pounds per square inch corresponding to the Brinell readings. For determining the Brinell numbers for other loads and other diam-

eters of ball, a book of tables of Brinell numbers corresponding to each 0.01 mm in diameter of the impression is furnished with the outfit.

The load of 750-Kg with the 5-mm ball gives the same Brinell numbers as the usual 3000-Kg load with a 10-mm ball and is used for cast iron, steel and hard bronze over 3 mm thick. For these materials when less than 3 mm thick the 2.5 ball and a load of 187-5 Kg are suggested. The 5-mm ball with a load of 250 Kg is recommended for brass, bronze and hard copper over 3 mm thick or the 10-mm ball and the same load are suggested for lead over 6 mm thick. For brass, bronze and copper less than 3 mm thick a load of 62.5 Kg and the 2.5-mm ball are recommended, and the same load with 5-mm ball for lead and zinc over 3 mm thick.

The outfit also includes a standard test piece of steel with an impression on it and its value. The whole outfit with box and the various accessories mentioned weighs only 5 lbs. and so is readily portable for use in any part of the shop where means are available for applying sufficient pressure.

Lincoln "Super-Visibility" Welding Lens

The Lincoln Electric Company, Dept. M-3, Cleveland, Ohio, is now offering to users of welding equipment a "Super-Visibility" welding Lens which is said to be so made that it absorbs all objectionable light rays while at the same time holding visibility at a point which permits a clear view of the work without tiring the eyes.

The experienced user of welding apparatus knows that the energy given out by the welding arc in the form of light embraces not only the visible rays to which the retina of the eye is responsive, but also the short infra-red rays and the long ultra-violet rays which, while normally invisible to the eye, are capable of serious visual injury. A lens of correct type will absorb the extremely short and long light rays, permitting visibility without injury to the eye. The quality of a lens is dependent upon its efficiency in absorbing the injurious rays. The Lincoln "Super-Visibility" lens has been subjected to tests by the U. S. Bureau of Standards, and the Bureau reports that the injurious light rays are absorbed 100 per cent.

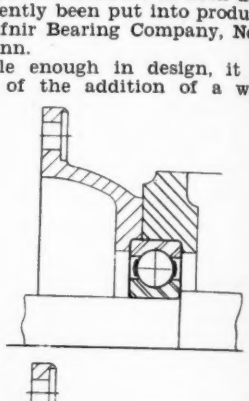
The Lincoln lens is made in two shades, which may be selected according to the brightness of the arc; either light

or dark. The light "A" lens is for metallic arc welding and the dark "B" lens is for carbon arc and heavy metallic arc work. The standard size of the lens is 2x4⅛ inches.

Fafnir "Type G" Ball Bearing Simplifies Mounting and Housing Design

A type of ball bearing which entirely eliminates one of the two shoulders formerly required in the housing where it is necessary to provide for taking a certain amount of thrust in both directions has recently been put into production by The Fafnir Bearing Company, New Britain, Conn.

Simple enough in design, it consists merely of the addition of a wire ring snapped into place in a groove cut on the outside of the bearing outer ring. This wire is placed near one face of the bearing, as shown, and, protruding one-eighth inch or so, furnishes a shoulder integral to the bearing itself, which abutting against the face of the housing does away with the need for a shoulder on the opposite side of the bearing. This will be clearer by a glance at the accompanying typical installation. It will be apparent also that not only is the hous-



Drawing illustrating design of Fafnir "Type G" Ball Bearing

ing design greatly simplified, but assembly is facilitated and considerable space saved in the overall length of the application. This latter feature is particularly advantageous in automobile design and in all applications where compactness is essential or where the weight of the bearing housing is a factor.

The drawing shows the relative saving in space by the use of the bearing. The fact that the housing may be bored straight through from one side is of great assistance in reducing machining costs also. The question arises whether this added snap ring can absorb sufficient thrust to make it a safe feature to incorporate in a bearing, but three years of research have proven conclusively that the capacity of the bearing is in no way lessened and that for applications where thrust is an incidental feature only, or where the housing shoulder serves the purpose mainly of locating the bearing on the shaft rather than absorbing purely thrust loads, this integral shoulder on the bearing is fully as satisfactory as the more complex one provided in the housing.

This bearing, designated by the letter G appearing after the bearing number, is available in eight popular sizes of the light 200 Series Single Row, and seven sizes of the medium 300 Series, according to the specifications following. Grease Seals can be furnished, just as in the case of the standard Single Row Bearing, and either the maximum capacity or non-filling slot type supplied, according to the user's preference and the service to be encountered. In the maximum type bearing the wire ring is placed on the side opposite the filling slot, and in the case of the grease seal bearings on the side opposite the seal.

In general, the wire is placed about one-eighth in. from the face of the bearing in a groove approximately 5/64 in. wide and 1/16 in. deep, although these dimensions vary slightly for different sizes as can be seen from the specifications.

Dixon Graph-Air Gun

In order to simplify the use of the Microfyne Flake Graphite made by the Joseph Dixon Crucible Co., Jersey City, N. J., this firm has brought out a lubricating device to be known as the "Graph-Air Gun". The gun is made of rubber, and when squeezed deposits the graphite where needed in measured amounts through positively controlled air pressure.

In order to fill the gun, the head is unscrewed, exposing a large opening

through which is inserted an "easy-pour chute-spout" that is attached to the can of graphite. A 2-inch nozzle is standard with each gun, but an 8-inch nozzle can be supplied if desired. A plug fitted to the bottom of the gun and easily snapped in and out carries a disc of chamois for use as a burnisher.

The volume of graphite deposited by

Dixon Graph-Air Gun. The lower illustrations show how the gun is opened and closed. A gun with 8-in. nozzle is also shown.

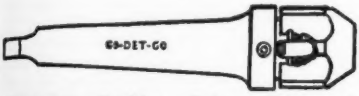
the gun is controlled by the position of the nozzle in relation to a graduated dial on the top of the gun. When not in use the dial may be turned to "shut" position, making it practical to carry the gun in a tool-kit without danger of spilling the graphite.

"Go-Det-Co" Positive Drive Holder For Woodruff Keyway Cutters

The latest addition to the line of tools marketed by the Goodspeed-Detroit Company, 2832 East Grant Blvd., Detroit, Michigan, under their trade name "Go-Det-Co," is a positive drive holder

for Woodruff Keyway Cutters in which there is an accurately adjustable stop to back up the cutters, giving a range of adjustment within the holder of ¼ inch and providing for adjustment to within one or two thousandths of an inch.

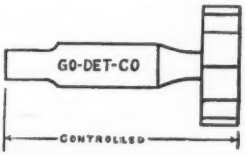
Another valuable feature of this holder is that it clamps the cutters in position without changing their location. It will be readily apparent that by using this holder and a controlled-length keyway cutter, which is a product of this same company, no further adjustments of



"Go-Det-Co" Positive Drive Holder for Keyway Cutters

either the cutter or the machine table will be necessary after a production job has once been set up. It is necessary only to place the new cutter in the holder against the stop, lock it in position, and proceed with the assurance that the location is correct. The cutter cannot slip; thus the danger of spoiled work due to slippage is eliminated.

The holder can be furnished with either No. 9, 10, or 11 B & S taper shank and in either the regular tang or draw-



"Go-Det-Co" Controlled Length Woodruff Keyway Cutters

bar type. Cutters can be supplied in all standard sizes.

Murex Coated Welding Electrode for High Carbon and High Strength Steels

Difficulty in arc welding steels containing more than .20 per cent carbon is overcome by a new heavy coated electrode, known as "Murex Special A," according to announcement by the Metal & Thermit Corporation, 120 Broadway,

New York City. The new electrode, an improvement of a previous design, hinders the migration of carbon from the parent metal to the deposited metal when welding and assures a more ductile deposit. Sound, dense, X-ray-clean welds, having excellent penetration, can

Perfect full-cupped fracture obtained at 73,000 lbs. per sq. in. in weld metal specimen made with Murex Electrode for welding high carbon steels.

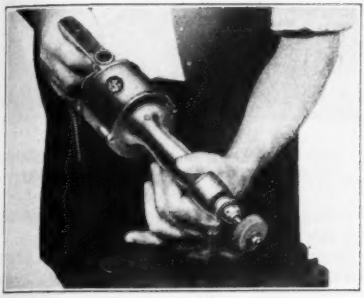
be made in high carbon steels with perfect ease with this new addition to the Murex line, it is claimed. The deposit, containing a small quantity of nickel, has unusually good physical properties and stress-relieved, all weld metal specimens invariably show clean full-cupped fractures under test. The tensile strength of these deposits is 73,000 lbs. per sq. inch and the yield point 59,000 lbs. per sq. inch. The elongation in 2 inches is 31 per cent, and the reduction in area is 63.5 per cent.

Other recently developed Murex electrodes, designed for use with the latest high strength steels now make it possible to obtain welds with tensile strengths of 85,000 to 100,000 lbs. per sq. inch. Such high strengths are obtained by including Nickel or Molybdenum, or a combination of these elements in the deposited metal. For example, one of the new electrodes, depositing 2½ per cent Nickel, is being used extensively in the welding of steels of this same analysis for low temperature work where welds must show Charpy impact resistance of 10 to 24 foot-pounds at the extremely low temperature of 75 degrees Fah. The physical properties of this weld metal are, it is said, extraordinary. Tensile strengths average 86,000 and yield points 72,000 lbs. per sq. inch. The elongation in 2 inches is 25.5 per cent. The reduction in area is 64 per cent. And, almost without exception, test specimens show clean, fully cupped fractures.

U. S. Hi-Speed Grinder

A portable electric grinder, especially designed for the particular class of work for which it is intended, has been brought out by the U. S. Electrical Tool Company, 2471 West 6th St., Cincinnati, Ohio. The tool is designed and built for continuous production service on such work as the removing of excess stock and for finishing operations in automobile body plants, foundries, die and mould shops, pattern shops and so on.

Ease in handling is a feature of the tool. Power is supplied through an universal motor, for operation on direct or alternating current of 60 cycles or less, running in precision ball bearings that



U. S. Type H. S. G. 20 Hi-Speed Grinder in Action

are enclosed in dust proof housings. The entire mechanism is protected by a rugged die cast aluminum housing. Power is controlled by means of a quick make and quick break trigger switch. The wheel arbor is held by a three-jaw geared chuck, the mechanism of which is protected by the housing.

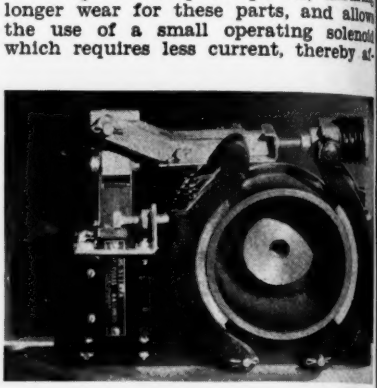
The "Hi-Speed" grinder can be furnished in either of two sizes, both having a motor no-load speed of 17,000 r. p. m., with or without the back handle. Without the back handle, the type H. S. G. 20 grinder is 15 inches long and weighs 4½ lbs. The type H. S. G. 18 grinder, with back handle, is 15½ inches long and weighs 5⅝ lbs. Either grinder takes a wheel of two inches maximum diameter.

A 3-jaw geared chuck, chuck key, and 3-conductor rubber covered cable and attachment plug are supplied as standard equipment. Grinding wheels and rotary milling files in a wide variety of shapes and sizes can be supplied for use with the Hi-Speed Grinder.

Cutler-Hammer Solenoid Operated Electric Brakes

A line of small A.C. and D.C. solenoid-operated brakes is announced by Cutler-Hammer, Inc., Milwaukee, Wisconsin. Three new brake sizes are included with torque ratings ranging from 3 lbs. feet to 75 lbs. feet. These torque ratings are in accordance with NEMA standards, conforming closely to the full load torque ratings of small standard motors.

The brake wheel is relatively large, allowing low total brake shoe pressures, which, distributed over the large brake lining area, results in low unit pressure on the lining and therefore long, even wear of the friction surfaces. The low shoe pressure also results in low stresses on all pins and pivot points, assuring longer wear for these parts, and allows the use of a small operating solenoid which requires less current, thereby af-



Cutler-Hammer Solenoid-Operated Electric Brake as applied to a small pulley.

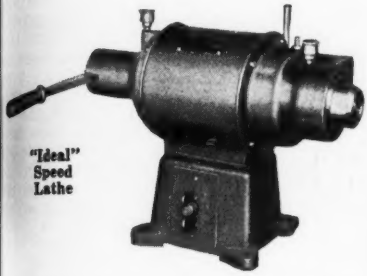
fecting a slight saving in operating costs of the brake.

Dimensions of the A.C. and D.C. brakes are interchangeable, so that machine designers can provide standard mounting holes and apply either the A.C. or D.C. brake as needed. Brake shoes use moulded brake lining and provide 180 degrees of braking service.

These new brakes are intended for applications on machine tools, conveyors, small hoists, dumb waiters, overhead door hoisting equipment, small elevators, printing presses, laundry equipment and similar small machines where quick, sure stops are required. Descriptive Bulletin No. 511 can be obtained from the manufacturer.

"Ideal" Speed Lathe

The illustration shows a speed lathe that has been placed on the market by the Schauer Machine Company, 905 Broadway, Cincinnati, Ohio. The machine is intended for use in finishing and polishing small parts. The construction of the lathe includes an automatic braking choice of two speeds, ball bearings, extension and motor spindle



"Ideal" Speed Lathe

to take an extra long rod stop or hollow spindle, universal or collet chuck, and a totally enclosed dust proof motor.

The speed desired is selected by means of a speed control switch in the motor base. Current is cut in by a slight backward position on the hand lever. The current is cut off and the brake is simultaneously and automatically applied by a forward movement of the hand lever. The braking is smooth and stops the motor in three seconds when running at high speed.

The motor is ½ h.p. and of two speed design. It is stated that this motor will operate continually without over-heating, yet is totally enclosed and dust proof.

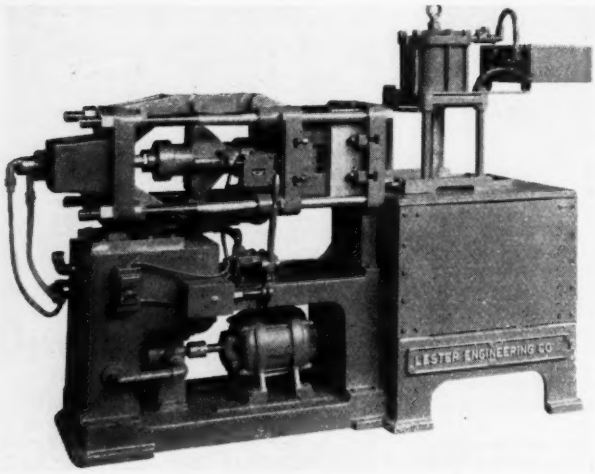
An extension within the motor spindle permits insertion of 1-inch rod or tube stop 9 inches long from the face of the chuck, thus making it possible to finish 12 in. to 16 in. rods without the necessity of a support. The lathe is regularly equipped with a 4-inch 3-jaw Universal chuck to take 1 inch rod or tube stop and to chuck up to 4 in., or a ¼-in. to ½-in. collet chuck for special work.

Double row ball bearings of ample size, dust proof and operating in grease, are mounted on both chuck and rear ends of spindle. This equipment can be furnished for bench mounting, as illustrated, or with a pedestal for floor mounting.

Lester Die Casting Machine

The Lester Engineering Company, Roseland and Arabella Rd., Cleveland, Ohio, has completed the development of its No. H-AP-1 Die Casting Machine, shown in the accompanying illustration.

There are three fundamental advantageous features claimed for this machine. First, the high speed of production is evidenced by the machine's ability to set a pace of well over 600 operations per hour. Second, the quality of the finished parts produced in this machine is on a par with the best results the die casting industry has been able to obtain. Third, the design and construction is such that all vital members are most accessible, breakage and wear are eliminated, time for job changes minimized and operation simplified.



Lester Die Casting Machine

The operation of the No. H-AP-1 Die Casting Machine is semi-automatic, being entirely controlled by one lever. Moving the lever toward the operator closes the die hydraulically. As soon as the die is completely closed and locked, the plunger operates, forcing the metal into the die. The plunger remains down, holding pressure on the metal for as long a period of time as is required for the particular part being cast. The plunger then returns to its original position and by moving the lever away from the operator, the dies are again opened. There is an easily accessible adjustment whi makes it possible to vary the time del which controls the opening of the di from ½ second up to 35 seconds. Th device also acts as a safety factor as prevents the opening of the dies until t metal has set.

The following are the specifications the No. H-AP-E7 machine

Die opens	5 inche
Max. Die height	12 inche
Min. Die height	4 inche
Clearance between bars	12x10 i
Metal pot capacity (Zinc)	300 lb
Locking pressure on die	35 ton
Machine weight	3400 lb
Plunger capacity (Zinc)	5 lb

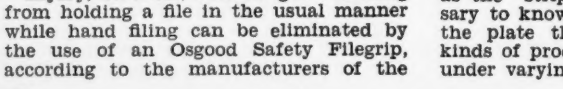
The high productio speed is obtained b means of a fast mov ing hydraulic toggl mechanism for di movement. This de vice is positive actin developing a sat locking pressure of 3 tons. This power ca be utilized in pullin large cores. In con junction with this di operating mechanism is an automatic plun ger control which eliminates all lost time between the variou phases of the cycle o operation.

Since the metal t be cast is injected in to the die by the solid displacement method the quality of the finished part, in re spect to solidity and surface finish, is th best obtainable. The injecting device is s constructed as to function properly fo the life of the vital parts. Wear betwee the plunger and metal cylinder is auto matically taken up and metal pressur is always maintained. Automatic plun ger control leads to uniformity of re sults by eliminating the human element and therefore to minimization of scrap age.

The design of the machine was pre dominated by a desire to make it simpl and rugged, and to eliminate breakag and wear but still maintain the feature of quick set-up and accessibility. Die can be changed in a minimum of time there being only one adjustment neces sary. Two larger sizes of this type o Die Casting Machine are being developed

Osgood Safety Filegrip

Injury, soreness, and fatigue resulting from holding a file in the usual manner while hand filing can be eliminated by the use of an Osgood Safety Filegrip, according to the manufacturers of the



File Equipped with Osgood Safety Filegrip

filegrip—the J. L. Osgood Machinery & Tool Co., Inc., 43 Pearl St., Buffalo, N. Y.

The Safety Filegrip is made of soft, pliable rubber, formed with a slot that allows for slipping the filegrip over the end of the file, and made to a shape that provides for gripping the file easily with the fingers. The filegrip can easily be applied to or removed from the file, but will not slip off while in operation.

A New Stripping Test for Udylite Coatings

Users of the Udylite coating process are usually interested in knowing the thickness of the coating that has been applied to their products, and for this purpose a test is used that is known as the "stripping" process. It is necessary to know definitely the thickness of the plate that is formed on different kinds of products, of different materials, under varying conditions, in order to be able to accurately specify the kind or thickness of coating desired, and there has been no method of testing as simple or as accurate as the "strip" method.

Tests that have been used previously are what is known as maximum thickness tests, and it is said by the Udylite Process Company, 3937 Bellevue Ave., Detroit, Michigan, that these tests do not show the weak points of the plates and, therefore, do not give a definite indication of the value of the coating.

Now, however, this company has brought out a stripping test that is said to indicate the minimum thickness accurately. It also shows the actual thickness of the plate at any one point. Thus it will point the way to improved plating practice where such is needed. If the stripping test shows small individual areas of thin plate on an area with otherwise heavier plates, one can be sure

hat the cleaning can be improved upon. the recesses show a very thin plate in omparison with the protruding points, he plater knows at once that his rack- ng arrangement is not what it should e or that his solution is off.

The new stripping test is a decided improvement over the old one in several other respects. One very important item is that its action is independent of the presence of minute amounts of impur- ities. Another advantage is that the ac- tion of the new test is independent of the nature of the base metal. The man-

ll that is needed to accurately determine the hickness of a cadmium coating is shown in his photograph. The test equipment consists f two bottles of reagent and two small dishes.

ufacturer states that the old test was lways unreliable on cast iron.

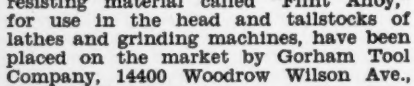
The method of testing is very simple. Two solutions are used, identified as 5A nd 5B. The solutions are poured into wo testing cups, then the object to be ested is immersed in the cup containing he 5A solution and held there for 15 econds. It is then rinsed in water and nspected. If the whole surface is cov- red with a brown film, the minimum thickness of the plate is at least 0.00005 inch. The film is now removed by rinsing in the solution 5B, then rinsed in water, and immersed for another 15 seconds in 5A. The inspection now shows whether or not the minimum thickness is greater than 0.00010 inch. This procedure is repeated until the base metal is reached, and the number of immersions required indicates the thickness of the plate.

The manufacturer states that in view of the superiority of the new test, the old one is being discontinued.

Gorham "Flint Alloy" Lathe and Grinder Centers

Centers of a permanently hard wear-resisting material called "Flint Alloy," for use in the head and tailstocks of lathes and grinding machines, have been placed on the market by Gorham Tool Company, 14400 Woodrow Wilson Ave., Detroit, Michigan.

Economy is combined with efficiency in the design of the center, the center proper being butt-welded to a carbon steel shank. The use of the Flint Alloy is



Gorham "Flint Alloy" Lathe Center

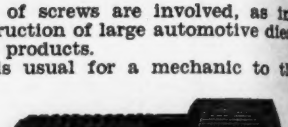
not confined to the tip, however; the Flint Alloy is used for the entire forward part of the center, thus assuring that a point of Flint Alloy will be available as long as the center is long enough to be useable. The manufacturer states that the center is chatter-proof, and that it has an unprecedented length of life.

The center can be furnished in Morse Taper sizes from 1 to 6; in Brown & Sharpe Taper sizes from 7 to 14, and in Jarno Taper sizes from 4 to 20. Special sizes or tapers can be furnished to customers' requirements.

Knurled "Unbrako" Socket Head Cap Screw

A new kind of socket head cap screw, shown in the illustration, has been placed on the market by Standard Pressed Steel Co., Jenkintown, Pa. The interesting feature of the screw is the knurled head. The object of the knurling is to make the driving of the screw much quicker and therefore cheaper, which is an important consideration where large quantities of screws are involved, as in the construction of large automotive dies and other products.

It is usual for a mechanic to thread



Knurled "Unbrako" Socket Head Cap Screw

screws in with his fingers wherever possible in order to save time. With smooth-head screws the fingers slip, whereas when the knurled "Unbrako" screws are used, the fingers are actually geared to the screws heads in process of threading in, making it impossible for the fingers to slip.

In intricate die assemblies it is often found that a socket screw will be located in a place that is difficult to get at with a wrench, as, for instance, in the press. In such cases pliers are usually resorted to. The manufacturer claims that actual tests have proven that the Knurled "Unbrako" screw has a torque five times that of a smooth-head screw, which in the case of a heavy die would mean the saving of a considerable sum. In addition to the increased efficiency, the screw is of neat appearance.

Permite Leaded Phosphor Bronze Bars

A forward stride in the production manufacture of special bearings, bushings, fittings and small parts is now possible through the development of Permite Leaded Phosphor Bronze Bars, according to announcement by Aluminum Industries, Inc., 2440 Beekman St., Cincinnati, Ohio.

Permite Bronze Bars are available in

standard six-foot lengths in diameters from ⅝ inch to 2 inches, by 1/16 inch steps. All standard bearing bronze alloys may be supplied. Manufacturers of screw machine products, and those who manufacture screw machine products for their own use, will hail Permite Bars as affording a real economy. It gives them a stock of superior bearing qualities for screw machine or turret lathe production. It represents the first time that leaded bearing bronze has ever been produced in machine lengths.

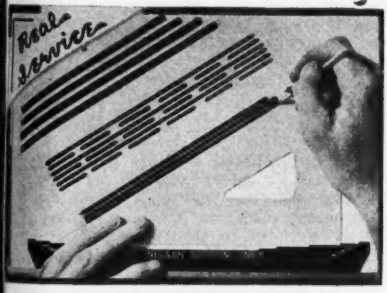
The stock possesses exceptionally free machining qualities. Using tungsten carbide tools, it has been successfully machined at speeds in excess of 1500 surface feet per minute, without a coolant. A turned finish has been adopted for Permite Bars. The better gripping afforded with this finish makes the free machining qualities completely available without excessive strain on the chucking mechanism. This exclusive finish, combined with the easy machineability of the material, will often permit production rates 50 per cent higher than those for drawn bar stock.

Producers of special bearings, and other parts of leaded bearing bronze, will readily appreciate the saving possible through the elimination of the many operations necessary to handle individual castings.

Permite Bronze Bars are produced to a metallurgically correct process, and are supervised in every phase of their manufacture by the Permite metallurgical laboratory.

Nelson Section Lines for Cross Hatching

Engineers and draftsmen will be interested in a tool that has been placed on



Nelson Section Liner for Cross Hatching

the market by The Nelson Section Liner, 727 N. Seventh St., DeKalb, Ill. The tool is called the "Nelson Section Liner" and it is said by the manufacturer that per-

fect cross hatching can be produced the use of this liner.

The liner is made of Bakelite, takes up no more room than an ordin 12-in. ruler on the drawing board. T illustration shows how the liner is us it is placed against the T-square and t triangle is located in one of the notch in the liner. Then as the lines a drawn, the liner is moved so that t triangle can be spaced as required b the draftsman.

The material is light in weight, but is strong and durable and corresponds thickness to the thickness of the t angles. The speed and accuracy possib by the use of this line undoubtedly a to the speed with which drawings can produced.

"Farrell-Birmingham Gear Data Book"

Thirty-six pages, 8½x11 inches in si are required to present the gear data a information that has been compiled the Farrell-Birmingham Company, In 381 Vulcan St., Buffalo, N. Y. This i formation is now presented to gear eng neers, gear manufacturers, and gear us under the above title.

The data included in this book are t net result of over 90 years experience the making of gears for all kinds of m chinery, for use in all kinds of industri —both heavy and light. Each kind a type of gear is discussed, with adva tages and disadvantages of design a performance.

The book gives tables for figuri horsepower of gearing; Specifications f Pinion Steels and Wheel Steels; Table Dimensions of Rolling Mill Pinions; D sign of Gear Wheels; and a vast fund other useful gear information. A copy the Data Book can be had by addre ing a request to the above address, usi the firm letterhead.

New Manual Tells How to Fabrica Stainless Clad Steel

A comprehensive guide to the fabric tion of stainless clad steel has be issued by the Ingersoll Steel and Di Company, 310 South Michigan Ave., Ch cago (division of the Borg-Warner Corp This 16 page booklet is entitled "Manu of Welding and Fabricating Procedur for IngAclad Stainless Clad Steel" a takes up, step by step, the vario methods of welding, soldering, lock sea ing, riveting, deep drawing, pickling, he treating, etc., encountered in fabricati products of stainless clad steel. T Manual contains many diagrams to gui

the fabricator in working the material.

A distinctive feature of the Manual is an illustrated section showing actual installations and applications of IngAclad in a wide range of industries. These include the food, soap, chemical, paper, brewing, dairy, building, and other industries that have used the material and subjected it to all of the procedures described in the Manual.

Other sections of this attractively prepared booklet are devoted to a description of the method of producing IngAclad by the original welded-in-the-ingot process, the physical properties of the clad material, etc.

A copy of the booklet can be obtained by addressing a request to the firm as above.

"Precision Measuring Devices"

Catalog No. 6A, now being issued by Standard Gage Company, Inc., Poughkeepsie, N. Y., contains 72 pages of descriptions and photographs of the "Standard Limit" gages made by this firm. The line includes standard dial indicators in various types and designs as required for different types of work, dial depth gages, dial pin gages, dial comparators, dial plug gages, adjustable limit snag gages, adjustable limit length gages, adjustable limit pin gages, taper gages, spline gages, ring gages, and other tools made by this firm.

Two pages of the book are devoted to tables giving the limits for use with plug gages or snap gages with the shaft as a basis and with plug gages or snap gages with the hole as a basis, as defined according to the "Standard" Limit Gaging System. It gives maximum and minimum limits for light running fits, running fits, sliding fits, push fits, driving fits, light force fits, and force fits, for the various diameters from 3/64 in. to 15¾ inches. These tables of "Standard" limits should be in the hands of every machine shop executive, design engineer, and tool engineer.

Copies free upon request.

"THE SOLID SHIM THAT PEELS:" In this 8-page booklet the Laminated Shim Company, Inc., 2126 44th Ave., Long Island City, N. Y., explains the advantages of the solid laminated brass shims made by this firm. The booklet is profusely illustrated with photographs showing how the thin sheets of brass are bonded together, a variety of the shapes in which laminated shims may be obtained, and a number of representative products in which laminated shims are used.

The ease with which any thickness of shim can be "peeled" and the accuracy of the shims are explained in detail. The shims are standard in thickness of from 1/64 in. to 3/16 in. with 0.002 or 0.003 in. laminations. No filing or machining is required; the laminations are stamped from sheet brass and any thickness of shim desired can be peeled from the block.

A copy of the booklet is available to any mechanical executive upon request.

Unique Gate-Valve "Cut-Out" Shows What Jenkins Offers

An unusual piece of valve literature is the 12-inch "cut-out" replica of a Jenkins Standard Iron Body Gate Valve that is being sent out to users of valves by Jenkins Bros., 80 White St., New York, N. Y.

The cut-out is the next best thing to having the real Jenkins Gate for inspection, as it provides an exact reproduction of both the exterior and the mechanism of a big, heavy Jenkins valve. An accurate listing of the features of Jenkins design and construction also is given in a form that makes it convenient for valve users to follow the suggestion to "compare point-for-point with other good valves."

One of the cut-outs can be had by addressing the Jenkins company at the above address.

Data Sheets on Special and Alloy Steels

A loose-leaf booklet containing 10 data sheets on Hy-Ten, Economo, and S. A. E. alloy steels is now being issued by Wheelock, Lovejoy & Co., Inc., 130 Sidney St., Cambridge, Mass.

The data sheets give heat treating instructions, physical properties, and data as to common uses of a wide range of special and alloy steels from .15 to 1.00 per cent carbon content.

The information carried on the sheets should be of prime value to purchasing agents or engineers who are concerned with the specifications of materials for machine or tool parts. A copy of the booklet will be sent to any mechanical executive, engineer, or purchasing agent upon request.

Light Metal Data for Engineers and Designers

A data book on light metals, intended for the engineer and user of metals, has been issued by the Dowmetal Division, Dow Chemical Company, Midland, Michigan. The book explains how the world's lightest structural metal may be fabricated by the processes that are common to industry.

Accepted shop practice in the working of light metals is described and methods of welding, riveting, forming, and machining are discussed in detail. Various available forms of Dowmetal are listed and described, such as sand or die castings, extruded shapes, forgings, sheet, plate, and strip metal.

Copies of the book may be obtained by

addressing the Dow Chemical Company as above.

ARMSTRONG - VANADIUM SUPER QUALITY DROP FORGED WRENCHES: The complete line of vanadium steel wrenches manufactured by Armstrong Bros. Tool Co., 328 N. Francisco Ave., Chicago, Ill., is described and illustrated in a new catalog that has been issued by this firm. The use of vanadium steel makes it possible to make a thin wrench, reducing the bulk and weight to the minimum, yet the wrench is strong enough to stand the hardest pull without breaking. Armstrong-Vanadium wrenches are guaranteed not to break or spread.

The catalog contains tables of specifications showing the length, size of openings, and weight for each wrench, according to the size of standard nut or bolt head the wrench is intended to take.

A copy of the catalog will be sent to any mechanical executive upon request.

COMTORPLUG AMPLIFIER NO. A2: A measuring internal gage that is easily operated, accurate, and durable is described in detail in a four-page folder that has been issued by The Comtor Company, Waltham, Mass. The tool, known as the Comtorplug Amplifier A2, consists of an amplifier and a number of interchangeable expansion plugs and reference standards, one for each size of hole Any plug can be placed in the amplifier in a few seconds.

When applied to the work, the Comtorplug reads, directly on its dial, the exact undersize or oversize of the hole. To use, the expansion plug is contracted, placed in the hole, and released in gaging position. The tool is effective for discovering and exploring out-of-round, taper, and bell-mouth conditions, or in measuring between flat surfaces.

Copies of the bulletin will be supplied upon request.

A Correction

The tool for cutting long cams in the shaper, described by Grant Villon on page 40 of the June, 1934, issue of MODERN MACHINE SHOP, was assumed by the editor to be "home-designed." On the contrary, the tool is a standard product of the Stockbridge Machine Co., Worcester, Mass., manufacturers of shapers and special shaping attachments.

Did You Know That---

A self-adjusting, positive variable-speed transmission for fractional horse-power duty is now available? See page 49.

The world and everything in it is composed of but 92 elements? See page 28.

An electric brake especially designed for machine tool application has been placed on the market? See page 60.

You can cut a manganese bronze weld with a hack saw blade? See page 1.

A set of tables of fits and tolerances comprising the experience of many years in a large plant is now published for the first time? See page 16.

A dial thickness measure no larger than a watch is now being made? See page 52.

Bars of Phosphor Bronze are now available in lengths up to 6 feet? See page 66.

A "safety" filegrip will save your mechanics' hands and prevent cuts? See page 64.

Fibre can best be machined when it contains a certain amount of moisture? See page 44.

You can have a modern "live" ball bearing center to try on your own work for 30 days at no charge? See page 58.

You can now buy wrenches that are guaranteed not to break or spread? See page 71.

For Your Catalog Library

Check any of these useful publications that you want, write your name, firm name, title and address on the margin, then tear out the page and send to Modern Machin eShop, 128 Opera Place, Cincinnati, Ohio. They will be forwarded to you promptly without cost or obligation. Please restrict your list to not more than five.

Advance Flexible Coupling: A simple but efficient coupling, made in three sizes, from ¼ h.p. to 10 h.p. Write Advance Tool & Die Casting Co., 3760 N. Holton St., Wilwaukee, Wis., for information.

Ames Dial Gages: Dial gages, gage heads, cylinder gages, dial thickness gages, dial micrometers and special gages and attachments made by the B. C. Ames Company, Waltham, Mass., are described and illustrated in Catalog 10. Write for copy.

Scrape by Power: Bearing surfaces can be scraped with a power scraper that is quicker and easier than the antique hand method. Write for information to Anderson Bros. Mfg. Co., 1928 Kishwaukee St., Rockford, Ill.

Steel Furniture for Office and Plant: Industrial furniture of steel, designed for efficiency and built for service, is described and illustrated in a catalog that has been issued by Angle Steel Stool Company, Plainwell, Michigan. Copy free.

A New Deal in Hacksaw Blades: "Blue End" Hacksaw Blades reduce costs by cutting faster and lasting longer. Write for data and prices to E. C. Atkins & Co., 402 S. Illinois St., Indianapolis, Ind.

"Ground-From-The-Solid" Taps: Bath taps are hardened in the solid, then the teeth are generated by grinding, producing absolutely accurate taps. Write for the "Ground Thread Handbook", free. John Bath & Co., Inc., Worcester, Mass.

Drop Forged Steel Die Sets: The economy and other advantages of drop forged steel die sets, which are now being made by E. A. Baumbach Manfg. Co., 1806 South Kilbourn Avenue, Chicago, Ill., are explained in a folder that can be had by addressing this firm.

The Finest of Accuracy can be obtained only by the use of the finest instruments. Write Bausch & Lomb Optical Co., 619 St. Paul St., Rochester, N. Y., for catalog of industrial microscopes, contour projectors, optical protractors, optical flats, spectrographic equipment, and other fine instruments.

Brighton Safety Set Screws provide an important factor of safety. No heads to project. The Brighton Screw & Mfg. Co., 1450 Harrison Ave., Cincinnati, Ohio.

Stop Air-Losses and shut-downs caused by leaky air valves. Write to Briggs & Stratton Corp., Dept. MS6, Milwaukee, Wis., for full information regarding the "Air-Saver".

Fine Tools of All Kinds are described and illustrated in a new catalog that has been issued by Brown & Sharpe Mfg. Co., Providence, R. I. Copy free.

645 Stock Sizes of Bronze Bushings are listed with dimensions and prices in the Buckeye Stock List "G". Write for it. Buckeye Brass & Mfg. Co., 6410 Hawthorne Ave., Cleveland, Ohio.

Carboloy Cost-Saving Tools: This booklet, issued by Carboloy Company, Inc., 2485 E. Grand Blvd., Detroit, Michigan, shows a variety of types and designs of Carboloy tools which will increase production and reduce machining costs. Copy free upon request.

"Hypro" Planers: The most modern engineering practice is incorporated in the design of Cincinnati "Hypro" Planers, made by the Cincinnati Planer Co., Oakley, Cincinnati, Ohio. Write for catalog.

"Circle R" Saws for cutting metal, made in both carbon and high speed steels, from ¼ in. to 10 in. in diameter, are now available. Write to Circular Tool Co., Inc., 767 Allens Ave., Providence, R. I., for catalog.

Balance Your Parts the Micro-Poise Way: Vibration can be removed from flywheels, fans, wheels and other rotating parts by eliminating dynamic unbalance. Ask Commerce Pattern Foundry & Machine Co., 2213 Grand River Ave., Detroit, Michigan, for full information.

Centerless Grinding: A high-speed service at low cost. If you have cylindrical parts to be ground, send blue-prints for estimates to Commercial Centerless Grinding Co., 6538 Carnegie Ave., Cleveland, Ohio.

Motorize Your Cone Pulley Lathes: An attachment that can be applied to your lathe with four bolts makes it possible to motorize and modernize your lathes. Write for information to Cullman Wheel Co., 1336 Altgeld St., Chicago, Ill.

Davis Keyseaters: The newest methods of keyseating are discussed in a bulletin that also describes and illustrates the keyseating machines made by the Davis Keyseater Co., 250 Mill St., Rochester, N. Y. Copy fre upon request.

Delta "Hand Milling Tools": The features that entitle Delta files to be called "hand milling tools" are discussed in a booklet that can be had by addressing The Delta File Works, 4837 James St. (Bridesburg), Philadelphia, Pa.

Grinding Wheel Dressers: All of the different types of grinding wheel dressers made by the Desmond-Stephan Mfg. Co., Urbana, Ohio, including Desmond-Huntington, Desmond-Sherman, Zig-Zag, Diamo-Carbo, and diamond dressers, are described and illustrated in a catalog that has been published by the firm mentioned. Free upon request.

Alloy Tool Steel for Cutting Tools, for Dies, or for Parts Manufacture: Write to Detroit Alloy Steel Co., Foot of Iron St., Detroit, Michigan, for a free set of specialized literature, Series F, describing the uses and advantages of modern alloy tool steels.

Assemble by Power: A power screwdriver that will set and screw in machine screws at a rate of from 400 to 500 screws an hour is described in a folder that can be had by writing to the Detroit Power Screwdriver Co., 5365 Rohns St., Detroit, Mich.

Steel Spacing Washers: Milling jobs can be set up quicker by using standard spacing washers, made by Detroit Stamping Co., 1345 West Fort Street, Detroit, Michigan. Write for information.

Special Quills for Precision Grinding, made by The Dumore Company, 28 Sixteenth St., Racine, Wis., are described and illustrated in a booklet that can be had by addressing the firm mentioned.

"Speed" Spot Welders for welding metals from 0.0005 in. to ⅜ in. thick are described in a catalog that can be had by addressing Eisler Electric Corp., 761 South 13th St., Newark, N. J.

"The Dragon" is the name of a publication that is devoted to bearings and bearing problems. It will be sent without charge to any mechanical executive who will address his request to The Fafnir Bearing Company, New Buffalo, Conn., using his firm letterhead.

Accurately-Cut Gears of all kinds, types and sizes can be had on short notice from Farrel-Birmingham Co., Inc., 381 Vulcan St., Buffalo, N. Y. Catalogs and engineering data on request, or submit your specifications for quotations.

Precision Measuring Instruments: The latest types and models of dial indicators, thread lead test gages, pitch gages, dial comparators, and other precision gages made by Federal Products Corporation, Providence, R. I., are described in a booklet that will be sent free upon application.

Performance Data On Swiss Jig Borers: This 36-page pamphlet shows various types of jobs from a power shovel turntable jig to a television disc, drilled and bored on Societe Genevoise High Speed Precision Borers, giving data as to size of holes, accuracy and time savings. Free upon request to The R. Y. Ferner Co., 1008 K Street, N. W., Washington, D. C.

Ford Rotary Files. M. A. Ford Mfg. Co., Davenport, Iowa, is issuing a catalog showing in addition to the complete line of Ford Rotary Files, illustrations of rotary files in use on various kinds of jobs. Write for copy.

Special Genessee Production Tools: A bulletin issued by Genessee Manufacturing Co., Inc., Rochester, N. Y., describes and illustrates some of the special production tools made by this company. Copy free upon request.

Tool Chests: Fine tools should be protected against damage or theft and the best way is to keep them in a fine tool chest. Write "Gerstner Tool Chests", 1227 Columbia St., Dayton, Ohio, for catalog of fine chests.

"Tools That Go and Go" is the title of a catalog describing and illustrating the milling cutters, inserted tooth cutters, railroad work cutters, expansion reamers and mills, thread hobs, and other cutters made by Goddard & Goddard Company, 12280 Burt Road, Detroit, Mich.

Better Centers will make possible more accurate work. Gorham "Flint Alloy" centers for lathes and grinders save grinding time and cost, with the maximum length of life. Write Gorham Tool Company, 14400 Woodrow Wilson Ave., Detroit, Mich., for specifications and prices.

3-Speed Riveters designed for high production and hard service over a long period of time are fully described in a catalog that will be sent upon request to Grant Mfg. & Machine Co., 96 Silliman Ave., Bridgeport, Conn.

Ball and Roller Bearings, either journal or thrust for all purposes and all sizes, are described and illustrated in catalog No. 9 which has been issued by The Gwilliam Company, 360 Furman Street, Brooklyn, N. Y. Copy fromm upon request.

"Liquid Baths for Heat Treatment of Steels": This booklet, published by E. F. Houghton & So., 240 West Somerset St., Philadelphia, Pa., is the essence of many years of research by the Houghton Research Laboratories. Write for a copy.

Dermatitis—Infection from cutting oils—can be prevented. Write to Huntington Laboratories, Inc., Huntington, Ind., for complete information.

Pyrometers: Inexpensive portable and stationary single unit and multi-circuit pyrometers are described in a catalog issued by Illinois Testing Laboratories, Inc., 146 West Austin Avenue, Chicago, Ill. Copy free upon request.

Oil and Waterproof Chucks: The J & H Electric Co., 202 Richmond Street, Providence, R. I., is now making a chuck that is oil and waterproof, and is designed to provide a maximum of holding surface with exceptionally strong and uniform pull throughout. Ask for complete information.

Stationary Type Tangent Dies in which the chaser holders can be changed without disassembling the die and in which adjustments can be made as fine as 0.00025 inch are now available. Write to Jones & Lamson Machine Company, Springfield, Vt., for complete details.

Diamond Tools for dressing grinding wheels can be obtained from E. Karelsen, Inc., 15 West 44th St., New York, N. Y. Also dressers reset and resharpened. Write for information.

Automatic Stops for Blanking Dies, made so that they can be easily and quickly installed, are described in a circular that can be had by addressing R. Krasberg & Sons Mfg. Co., 2310 Wolfram St., Chicago, Ill.

Cams—Any Style—Any Size—up to 50 inches can be had from Kux-Lohner Machine Co., 3147 Lexington St., Chicago, Ill. Write for data.

Threading Machinery: Complete catalogs of individual bulletins covering the pipe threading and cutting machines, bolt threading machines, or die heads made by Landis Machine Co., Waynesboro, Penna., may be had upon request from this firm. State size and type of machine or die head.

Use Steel in Coils... Coils can be handled easily and economically by the use of an automatic centering reel. Write for full particulars to F. J. Littell Machine Co., 4127 Ravenswood Ave., Chicago, Ill.

Air-Operated Work-Holding Devices: A booklet showing how air-operated chucks and devices of various kinds can be applied to different kinds of machines to save time and labor has been issued by The Logansport Machine Co., Logansport, Ind.

L-R Flexible Couplings are simple, resilient, reversible. Only three parts. Write Lovejoy Tool Works, 303 West Ohio St., Chicago, Ill., for information.

"Last Word" Indicators, built for accuracy, adaptability, and dependability are described in a circular that can be had by addressing H. A. Lowe Co., 1875 East 66th St., Cleveland, Ohio.

Magnolia Bronze Bar Stock, semi-finished inside and outside in S. A. E. specifications is now available. Write to Magnolia Metal Company, Elizabeth, N. J., for folder.

McCrosky Block Boring Bars: A new and improved method of accurately locating and locking the block in the bar provides any desired amount of float, with a new method of taking cutting thrusts. Ask McCrosky Tool Corporation, Meadville, Pa., for Bulletin 12-D.

Mendes Diamond Point Angle Tools for Wheel Dressing are described in Folder "M", issued by Mendes Cutting Factories, Inc., 105 West 40th St., New York, N. Y. Copy free upon request.

Keyway-Cutting is a simple operation when the right tools are used. Write for catalog of modern keyway cutting machines to Mitts & Merrill, 1009 S. Water St., Saginaw, Mich.

"Modern" Feed Finger can be used for hex or round stock or for hex or square stock; uses no screws, yet is so designed that the pads cannot come loose. Write to Modern Collet & Machine Co., 401 Salliotte St., Ecorse, Michigan, for full information.

"Practical Machinist's Guide." A handy shop manual, containing tables of tapers, speeds and feeds, instruction for grinding twist drills, thread dimensions, tap drill sizes, and other useful information can be had by writing to Morse Twist Drill & Machine Co., Dept. 32, New Bedford, Mass.

Compound Spot-Facing Tool: A spot-facing tool containing retracing, serrated roughing cutters and fixed finishing cuters in the same tool will break up the scale easily and do accurate work. Write for bulletin to Mummert-Dixon Co., 120 Philadelphia St., Hanover, Penna.

Mill Keyseats with a Drill Press: A special attachment that can be applied to a drilling machine for milling keyways is now being made by National Machine Tool Co., 2271 Spring Grove Ave., Cincinnati, Ohio. Ask for circular.

Time Study Work gives a man a knowledge of plant operation and manufacturing methods that can be obtained in no other manner. Write to National School of Time Study, Box 336B, Norwalk, Conn., for an interesting free booklet on this subject.

Speed and Accurary in Drilling Holes are assured by the use of a Universal Drilling Plate. Write for full details to National Tool & Machine Co., 41 So. Water St., Rochester, N. Y.

Reduce Equipment Expense: Nicholson Expanding Mandrels will save on your equipment investment and will insure a mandrel for holes of every size from ¼ in. to 7 in. Write for details to W. H. Nicholson & Co., 136 Oregon St., Wilkes-Barre, Pa.

Ball and Roller Bearing Data Sheets: A complete set of data sheets showing all the dimensions and loads at given speeds, and giving instructions for mounting precision ball bearing and Hoffmann roller bearings, can be obtained without charge by addressing the Norma-Hoffmann Bearings Corporation, Stamford, Conn.

Stamp with Numberail: The complete set of figures or letters all combined in one tool, preventing loss of single letter or digits. Write for catalog. Numerball Stamp & Tool Co., Huguenot Park, Staten Island, N. Y.

Speed Reducers: Speed Reducers to obtain any desired reduction up to 24,000 to 1 are described and illustrated in Catalog 29 A, issued by The Ohio Gear Co., 1335 East 179th St., Cleveland, Ohio. Copy free upon request.

Die Making Machines: How dies, templates, gages, etc., can be sawed out, filed, and lapped easily and accurately on Oliver die making machines, is fully described in a bulletin issued by the Oliver Instrument Company, 1430 Maumee Street, Adrian, Mich. Mailed upon request.

No More Cut Hands caused by using files with unguarded tangs. Write to J. L. Osgood Machinery & Tool Co., Inc., 43 Pearl St., Buffalo, N. Y., for bulletin of Osgood Safety File Handles and Safety File Grips.

Precision Gages designed according to the most modern methods and produced by the most modern equipment are described and illustrated in a folder that will be sent upon application to Precision Gage & Tool Co., 322 East Third St., Dayton, O.

Any Drill Press is a Tapping Machine when a Procunier Tapping Attachment is used with it. Write for descriptive circular. Procunier Safety Chuck Co., 12 So. Clinton St., Chicago, Ill.

Production No. 601 Machine for sanding, surfacing, polishing, burring; leaves a straight line finish; eliminates hand labor. Write Production Machine Co., Greenfield, Mass., for illustrated folder.

Woodruff Keyway Cutters made to special specifications. Write Quality Tool Works, Waukegon, Ill., for information.

Bench Lathe Mounting and Driving Equipment: Bulletin 120-A, issued by Rivett Lathe and Grinder Corporation, Brighton, Mass., contains complete descriptions and illustrations of modern and conventional countershafts, individual motor drive jackshaft, and speed box motor drive, also benches, cabinets, oil pans, etc. Copy free upon request.

Rotor Air Tools: The latest types of air-operated hand tools for grinding, polishing, drilling, and other similar operations are described and illustrated in a 24-page book that can be had by writing The Rotor Air Tool Company, 5704 Carnegie Ave., Cleveland, Ohio.

End Your Coolant Troubles by using a Ruthman Gusher Pump. Write for information to Ruthman Machinery Co., 536 East Front St., Cincinnati, Ohio.

Cut small gears, pinions, ratchets, automatically. An automatic hobbing machine for small work with magazine feed, is described in Catalog WMI, issued by Geo. Scherr Co., 130 Lafayette St., New York, N. Y. Write for free copy.

Simonds Files: A useful book on files showing the various styles made, their uses, cross-section, and cuts, and containing a number of reference tables and other information useful in a machine shop can be had by addressing Advertising Dept., Simonds Saw & Steel Co., 470 Main Street, Fitchburg, Mass.

"Diamonds for Industrial Purposes" is the name of an interesting book on mining, grading, and uses of diamonds of all kinds. Write to Anton Smit & So., 24 State St., New York, N. Y., for a copy.

Diamonds for Industrial Purposes: The complete line of industrial diamonds and diamond-pointed tools made by J. K. Smit & Sons, Inc., 157 Chambers St., New York, N. Y., is described in a circular that will be sent upon request.

Complete Storage Units that can be moved about individually or included in a complete bin section are described in a circular that will be sent free upon request to Stackbin Corporation, Troy St., Providence, R. I.

The Live Center you have been Looking For: The Sturdimatic Live Center has eight outstanding features; just what you have been looking for. Ask for bulletin and prices. Sturdimatic Tool Co., 5222 Third Ave., Detroit, Mich.

Cutting and Grinding Facts: A discussion of cutting oils and lubricants, together with descriptions and illustrations of various types of jobs upon which cutting oils are used, is contained in a booklet that is issued by The Sun Oil Co., 1608 Walnut St., Philadelphia, Penna. Free upon request.

Sutton "Sur-Grip" Collets with Diamond Serrations are fully described in a folder that will be sent without charge upon application to Sutton Tool Company, 2842 W. Grand Blvd., Detroit, Mich.

Steels for shafting, manufacturing, and all other purposes where cold finished steels are required can be had in a wide range of sizes, ready for use. Ask Union Drawn Steel Co., Massillon, Ohio, for name of nearest distributor.

Universal Drill Bushings: Interchangeable Nitrided Drill Bushings, and Universal Tool Holder your production problems. Write for Data Sheets. Shanks for end mills and other tools will simplify. Universal Engineering Co., Frankenmuth, Michigan.

Multiple Drilling With a Single-Spindle Drill: Methods by which multiple drilling may be done on a single-spindle drill using multiple spindle drill heads are discussed in a bulletin that is issued by The United States Drill Head Co., 1954 Riverside Drive, Cincinnati, Ohio.

Electrically-Driven Portable Tools: The "U. S." line of electric drills, die grinders, surface grinders, toolpost grinders, and bench and floor grinders is described in Catalog No. 33, published by The United States Electrical Tool Co., 2471 West Sixth Street, Cincinnati, Ohio. Copy free.

"Extra Value" Hack Saw Blades: Hack saw blades made of an alloy in which molybdenum is used, and which are said to withstand shock and wear to an unusual degree are now being made by Victor Saw Works, Middletown, N. Y. Full particulars will be sent upon request.

Waltham Cylindrical Sub-Presses may be adjusted for wear and perfect alignment can be maintained. Booklet on Sub-Presses and Dies can be had by addressing Waltham Machine Works, Waltham, Mass.

Toolmakers' Tool Chest: The complete line of fine tool chests for toolmakers and machinists made by J. M. Waterston, 420 Woodward Ave., Detroit, Mich., is described in Catalog No. 25. Write for it.

Westcott Chucks are the product of over 60 years of concentration upon chuck-building. Write for catalog showing the complete line. Address Westcott Chuck Co., 124 East Walnut St., Oneida, N. Y.

Expanding Mandrels Will Solve Your Problem: A set of 12 "Champion" Expanding Mandrels will fit any hole from ⅛ in. to 6¼ in. Write for details to The Western Tool & Mfg. Co., Springfield, Ohio.

The "Truco" Dressing Tool is designed for flexibility, efficiency and economy. Write for folder and prices to Wheel Trueing Co., Inc., 13931 Oakland Ave., Detroit, Mich.

Power Drive In Any Position: The modern flexible shaft makes it possible to drive all kinds and types of tools in places and positions impossible of access with straight-shaft machines. Ask The S. S. White Dental Mfg. Co., Industrial Division, 150A West 42nd Street, New York, N. Y., for the "Flexible Shaft Handbook". Copy free to any mechanical executive addressing this firm on his firm letterhead.

Ball Bearing Punches, shears, angle iron machinery, brakes and punches and dies of all descriptions are described and illustrated in a catalog that can be had by addressing Whitney Metal Tool Co., 110 Forbes St., Rockford, Ill.

Feed Stock from Coils at High Speed: Bulletin MS, issued by Wittek Manfg. Co., 4305 W. 24th Place, Chicago, Ill., gives full details regarding the Wittek Automatic Rool Feed for Punch Presses. Copy free upon request.